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UNIVERSITY OF MASSACHUSETTS BULLETIN

UNIVERSITY OF MASSACHUSETTS

SUMMER SESSIONS-1964

EARLY REGISTRATION

Applications and Registration Forms received prior to June 1 for the first six-week session and prior to July 13 for the second six-week session will allow a student to proceed through registration in the minimum time.

VOLUME LVI • FEBRUARY, 1964 • NUMBER 1

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University of Massachusetts

Summer Session

1964

Two Six-Week Sessions

June 15-July 24

July 27-September 4

Special Shorter Sessions and Offerings in

Engineering

Forestry

Home Economics

Nursing

ADMINISTRATIVE OFFICERS

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Helen Curtis, A.B., A.M. ..... *Dean of Women*
Hugh Montgomery, B.S., B.S. IN L.S. ..... *Librarian*

CALENDAR FOR THE SUMMER SESSION

First Six-Week Session

Registration	June 15, Monday
Classes Begin	June 16, Tuesday

(All courses in the School of Education will meet during the late afternoon or evening during the week of June 15 to accommodate teachers who are still in service. A schedule will be available at registration.)

Classes End	July 24, Friday

Second Six-Week Session

Registration	July 27, Monday
Classes Begin	July 28, Tuesday
Classes End	September 4, Friday

Final Examinations—given during regular class time; may take two class periods at option of instructor

Registration for both main sessions and special sessions starting on either June 15 or July 27 will be held in the Student Union Ballroom. Registration for other summer courses will be at the Registrar's Office, South College, on the first day of the session. On June 15 and July 27 the following schedule will be followed (students may register *after* their assigned time, but not before):

Last name beginning with

C-D	1:00 p.m.
E-H	1:30 p.m.
I-M	2:00 p.m.
N-R	2:30 p.m.
S-T	3:00 p.m.
U-Z	3:30 p.m.
A-B	4:00 p.m.

CLOSED 5:00 p.m.-6:00 p.m.
OPEN 6:00 p.m.-7:30 p.m.
(For those unable to come earlier)

TO AVOID DELAYS ON REGISTRATION DAY, ALL STUDENTS SHOULD SEND IN THEIR APPLICATIONS, RESIDENCE FORMS, AND CERTIFICATES OF RESIDENCE (IF APPLICABLE) AT THE EARLIEST POSSIBLE DATE.

APPLICATION FORMS MAY BE OBTAINED FROM THE REGISTRAR'S OFFICE, SOUTH COLLEGE, UNIVERSITY OF MASSACHUSETTS, AMHERST, MASS.

General Information

The University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier.

Now in its second century, the University is a member of the great community of Land Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry. Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges—in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus consists of approximately 950 acres of land and 90 buildings. These structures—including classroom and laboratory facilities as well as dormitories and other units—extend in a great circle around the Campus Pond. This arrangement helps in maintaining the University as a community in which the individual holds central importance.

The community itself is located in a region that offers outstanding opportunities for a student's cultural development. Art exhibits, dramatic productions, concerts, and other activities in the Four College area are fully available to all students. In addition, the University maintains excellent recreational facilities as well as intercollegiate and intramural sports activities. The total program is dedicated to giving every student a chance to develop all of his capabilities under the best possible conditions. As the University moves into its second century, this will continue to be its prime objective.

THE UNIVERSITY RESERVES, FOR ITSELF AND ITS DEPARTMENTS, THE RIGHT TO WITHDRAW OR CHANGE THE ANNOUNCEMENTS MADE IN THIS CATALOGUE.

Programs Offered

The Summer Session for 1964 at the University of Massachusetts will consist of two six-week terms. Registration day for the first six-week term will be June 15, with classes beginning on June 16 and ending on July 24. Registration day for the second six-week term will be on July 27, with classes beginning on July 28 and ending on September 4. Special courses will run throughout the summer beginning on June 1. These are described in the Directory of Courses section of this bulletin. Students who are enrolled in one of the special courses which meet for one, two or three weeks normally will enroll for that course only. Most of these courses run for eight hours a day, so that dual registration is not possible.

During the Summer Session most of the basic courses will be offered, enabling the student to make substantial progress toward his degree. With careful planning and regular attendance it is possible, through judicious use of Summer Session attendance, to obtain a bachelor's degree in three calendar years.

The full facilities of the University—its professional teaching staff, classrooms, libraries, laboratories, dining rooms and dormitories—will be available this summer.

ENTERING FRESHMEN

The University of Massachusetts is inviting well-qualified high school graduates to begin their college education immediately after June, 1964, graduation. Because of the rising enrollment pressures on University facilities, the University believes that for certain students a summer program of studies might be helpful. For the good student who, perhaps, is already convinced his formal education will require graduate or professional studies after his undergraduate work, an early start may save him valuable time. Similarly, students in financial need may find it less expensive overall to complete their undergraduate work in as short a time as possible. Summer Session attendance can substantially reduce the time necessary to get a bachelor's degree. Students who wish to start their undergraduate work in the summer of 1964 *must apply for regular admission* in the spring. Further information will be sent to each applicant by the Registrar with the application form.

June graduates of high schools, certified for college work, may begin required freshman courses including those in English, languages, natural and social sciences and physical education. (All entering freshmen will be required to take physical education in the summer for non-academic credit. This course is timed so that it will not conflict with a regular program of study and this credit may be taken in addition to the normal study load.)

PROGRAMS IN EDUCATION

Program for Teacher Certification. The School of Education is continuing its program of preparation toward teacher certification for undergraduates and graduates of colleges of liberal arts and science who wish to teach in either elementary or secondary schools and who find it difficult to take courses during the regular university year. The program includes four professional courses in the summer followed by student teaching in public schools during the fall. In certain cases in emergency fields such as elementary education, foreign languages, mathematics, and sciences it may be possible to arrange a year's internship with full pay in a public school in place of student teaching.

New Courses. Once again there are several new courses offered for the first time during the summer. Language and Logic of Teaching, Laboratory Practicum in Secondary Science, and Educational Sociology might be of interest to all graduate students.

Study-Experience Program. Certain courses in Kindergarten Education, The Gifted Child, Modern Mathematics, and Remedial Reading offer excellent opportunities to learn course content and then to apply it by direct contact with children in a workshop. These workshops involve working with individual or small groups of children in the facilities of the Mark's Meadow Laboratory School.

Special attention is drawn to the fact that in the Study-Experience Program a student must not take a workshop course unless he takes simultaneously or had taken the accompanying content course.

Specialization. Attention is also drawn to the areas of concentration in these particular fields (1) Audio Visual — 120, 121, 122, 66, 166, 267 (2) Reading—61, 161, 265, 257, 263, 264 (3) Vocational Agriculture—72, 172, 75, 175, and the two areas under the new doctorate program (4) Guidance—216, 242, 77, 177, 240 and (5) Administration—213, 209, 283, 216.

For a more detailed description of the various programs and for application materials the candidate should write to the Dean, School of Education, University of Massachusetts, Amherst.

SPECIAL PROGRAM IN SPEECH THERAPY

The Department of Speech offers a special program in speech therapy of particular interest to present and prospective personnel in the areas of speech therapy, classroom teaching, medicine, nursing, guidance, and social service. Speech 85, 185 *Introduction to Speech Pathology* will be of special interest to fields allied to Speech in presenting needs of children and adults with significant speech handicaps. Speech 88, 188 will present an unusual opportunity for speech and hearing therapists and advanced students in intensive supervised clinical practice.

HIGH SCHOOL JUNIORS

The University of Massachusetts annually invites high school students who have completed their junior year of high school with outstanding records and who are nominated by their high school principals to attend the Summer Session. In this way students may take work on the college level to enrich their high school education or to do work in a field they might not otherwise be able to cover. It is hoped that this program will help students enter any college with advanced standing.

While students in this category will ordinarily return to their own high schools to complete their senior year, some may wish to apply for admission as full-time students at the University in September, 1964 after successful completion of the summer program. The University does not guarantee admission at that time, but each case will be treated individually.

Students who are nominated by their high school principals are required to take the Scholastic Aptitude Test of the College Entrance Examination Board no later than May of their junior year.

Inquiries about and recommendations for this special program should be addressed to the Office of Admissions, South College, University of Massachusetts, Amherst, Massachusetts.

CREDIT FOR SUMMER WORK

All courses carry degree credit and are equivalent in method, content, and credit to courses offered in the University during the regular academic year. Credits obtained in these courses are ordinarily accepted as transfer credits by other colleges and universities. Students desiring to pursue courses for the advanced degrees must seek the approval of the Dean of the Graduate School.

THESIS AND SPECIAL PROBLEMS CREDIT

Graduate students contemplating special problems course work and thesis work during the Summer Session should seek the permission of their Department Heads and/or advisers and get approval from the Dean of the Graduate School. Such programs, although not listed by title and number in the Summer Session bulletin, are available by many departments on campus during the Summer Session.

ADVANCE ENROLLMENT (UNDERGRADUATE AND GRADUATE STUDENTS)

To expedite advance enrollment, or to obtain approval of admission, undergraduate students contemplating attendance should notify the Registrar as soon as possible. Graduate students must receive approval for admission from the Dean of the Graduate School. *Payment of fees and other costs prior to the registration date is strongly advised to insure enrollment in certain courses offered.*

EXPENSES

In order to avoid delays at registration, students are encouraged to register before June first by mail. This will allow the Treasurer's Office to prepare a fee statement for each student and will enable the student to pay his bill in advance. Students who do not preregister by June 1 should be prepared to pay their term bill *by personal check* at the time of registration. Students who do not register on or before the respective registration dates will be liable to payment of the regular late registration of $5.00. Students whose bills are not paid on the same dates for the same terms will be similarly liable for payment of the late payment fee of $5.00.

Tuition for residents of Massachusetts	$10.00 per credit hour
Tuition for non-residents of Massachusetts	15.00 per credit hour
Health Fee*	1.00 per week
Student Union Fee*	1.00 per week
Student Recreation Fee*	1.00 per session

*These fees must be paid by all students, including commuters

Board

One week	$10.00
Two weeks	20.00
Three weeks	31.00
Six weeks	62.00

Rent

One week	9.00
Two weeks	19.00
Three weeks	28.00
Six weeks	56.00

Books, Stationery and Supply Expenses:

Students should be financially prepared to pay for necessary books and incidental supplies. Certain departments also make special charges for necessary laboratory supplies.

Special Examinations:

Students receiving credit by special examination must pay $5.00 per credit before the examination may be taken.

Tuition and Fee Refunds

A student who leaves the University for any reason except as specified below before a term is completed will be granted a refund of tuition and fees in accordance with the following schedule:

a. During the first week—60%
b. During the second week—20%
c. After the second week—no refund

A student who makes an advance payment and then for any reason does not attend any part of the term at the University will be given a full refund of tuition and fees.

A student who is involuntarily called into military service before the completion of a term will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that term. If academic credit is given, there will be no refund.

A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

RESIDENCE

New students who are residents of Massachusetts must file certificate of residence with the Treasurer's Office in order to obtain the residential tuition rate.

HOUSING AND BOARD

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus residence halls and be required to eat at University dining halls unless given permission to commute from their parents' homes. University board is optional for seniors and those over 21 and is available on a cash basis.

Residence halls will be open for occupancy at 2:00 p.m. on the day immediately preceding registration day and will close on the day following the final day of classes. Knowlton will be the residence hall for women and Gorman and Brett for men. Room assignments will be available from the Head of Residence of each dormitory on arrival.

Most rooms are double and are provided with basic furniture, including mattress. Each student is responsible for providing study lamp, metal wastebasket, ash tray if desired, also pillow, blankets, bed linen, and towels, either supplying them personally or subscribing to a linen service, available locally.

Married students may write to the University Housing Office regarding accommodations.

Meal tickets for dormitory residents provide board at the University Dining Commons on a five-day basis (Monday through Friday). Cafeteria service is available in the Coffee Shop of the Student Union on weekends and during the summer for other students desiring food service.

VETERANS

Veterans who plan to enroll under the G. I. Bill (P. L. 550) should present—not later than the time of registration — evidence of eligibility or make application for training at that time. Students already enrolled under P. L. 550 should re-enroll for Summer Session

work. Under this law, veterans receive an education and training allowance from the Veterans Administration from which they pay their own university fees and purchase their own books and supplies. Students already enrolled under P. L. 634 also should re-enroll for Summer Session work. Students should see Mr. George Emery, Machmer Hall, for further information on this program.

UNIVERSITY HEALTH SERVICE

Medical consultation and treatment are available to students at the University infirmary. The infirmary, located east of French Hall and Durfee Conservatory and north of Brooks House, furnishes ordinary medical care for students.

RECREATION AND ENTERTAINMENT

The Student Union Building, a center of student activity and social life, serves as a recreational center and common meeting place for the University Community. Attractively furnished, the Union provides lounges, music listening rooms, piano practice rooms, reading rooms, meeting rooms, barber shop, food service area, bookstore, information, lost and found, and games area consisting of billiards, bowling alleys, table tennis, television, and card table games.

A Student Activities Office and staff, located in the Student Union Building, plan and execute the social and recreational programs for the Summer Session students. The natural environment in which the University is located affords almost unlimited facilities for combining recreational activities with academic and professional achievement. Indoor and outdoor extracurricular activities are designed to meet varying interests of individuals. Such features as band concerts, movies, dances, professional entertainment are planned along with arrangements for summer theatre. In addition, programs for recreation offering informal sports such as swimming, softball, tennis and hiking are available. A get-acquainted barbecue is scheduled during the session. A golf course, located within five minutes drive of the University campus, is available to students upon payment of greens fees. Outdoor swimming is available at the community pool and in several small lakes in the immediate area.

PLACEMENT AND FINANCIAL AID SERVICES

Scholarships: A limited number of scholarships are available to full-time students pursuing a degree at the University of Massachusetts. Applications may be obtained from Placement & Financial Aid Services, Machmer Hall, University of Massachusetts, Amherst, Mass. Completed forms should be returned for consideration no later than June 1, 1964.

Loans: Three types of loans are available to full-time students pursuing a degree at the University of Massachusetts — University Short-Term loans, Massachusetts Higher Education loans and National Defense Education Act loans. Students should see Mr. David P. Lawrence, As-

sistant Director, Placement & Financial Aid Services, Machmer Hall, for information on these programs.

Part-Time Student Employment: Campus part-time jobs are available for a limited number of students. Students seeking employment should see Mr. George E. Emery, Placement Officer for Men, and Miss Edith V. Antunes, Placement Officer for Women. Their offices are located in Placement and Financial Aid Services, Machmer Hall.

REGULATIONS

Normal University regulations will apply during the Summer Session. The regulation concerned with adding and dropping courses will be as follows for the shorter Summer Session: Students may add or drop any course within four class days without penalty. Students may drop any course between the fourth day but before the eleventh day with a mark of W (Withdrawn) being recorded. After the tenth day any course dropped is recorded WF (Withdrew Failing). This grade is computed in the quality point average. An exception may be made to this rule in certain cases of protracted illness or serious personal or social problems. In such exceptions, a WP (Withdrew Passing) may be recorded if the student obtains (1) the favorable recommendation of the appropriate University Health or Student Personnel officer, (2) the approval of his advisor and the Provost, and (3) a certificate from his instructor that the student was passing the course at the time that he first contacted the University Health or Student Personnel officer with regard to his problem. An overload of courses is not considered sufficient grounds for dropping under this arrangement.

Course Directory

The information in the Directory of Courses section of the bulletin is complete for each course. *Building and room assignments will be available at registration.* Preceding the course title is the course number, which follows a definite pattern. Courses numbered from *1 to 49* are freshman and sophomore courses. Courses numbered from *50 to 99* are junior and senior courses. These courses (*50-99*) may be followed by a second number after a comma, such as *51, 151 or 77, 177*. This indicates that these courses may also be taken for graduate credit with the completion of additional requirements as determined by the instructor. Courses numbered from *100-149* are graduate level courses, as are courses numbered *200 and above.*

Following the course title is a code which indicates the credit for the course, the term in which it is taught and the letter indicating the hour of the day during which the course will be taught. For instance, I A 3 cr indicates that this course will be offered during the first main term for three credits and that it meets in the 7:45 to 9:15 a.m. block.

Courses will meet five days a week for one hour and twenty minutes, in general. Studio and laboratory courses may meet for two periods or during the longer time period during the afternoon.

The first and second main terms are indicated by I and II. Special terms are indicated by Arabic numbers which correspond to starting dates as follows:

1	June 1
2	June 15
3	June 18
4	June 22
5	June 29
6	July 6
7	July 27
8	August 17

Courses which meet during a special term have no indication for hour of meeting, since most of these meet eight hours a day.

The letter code for the time periods is as follows:

A ..... 7:45- 9:15 a.m.
B ..... 9:15-10:45 a.m.
C .....10:45-12:15 p.m.
D .....Afternoon period starting at 1:15 p.m.
E .....Afternoon period starting at 4:00 p.m.

Final examinations will be given during the regular class hour and may take two days at the option of the instructor.

College of Agriculture

DEPARTMENT OF AGRICULTURAL ENGINEERING

AGRICULTURAL ENGINEERING 190 Instrumentation I-II A 3 cr

The study of instruments as applied to research. Recorders, indicators, controllers, and transducers in general. Transducers will be covered in detail for ten or more common variables including temperature, pressure and humidity. Special emphasis on applications and limitations. Twelve weeks.

AGRICULTURAL ENGINEERING 241 Control of Heat and Vapor Flow in Agricultural Buildings and Processes I-II B 3 cr

Application of mass flow theory to heat and vapor transfer. Thermal and vapor interchange between environment and livestock controlling production rates of metabolic and respiratory heat. The application of instruments and controls. Prerequisite, Permission of Instructor. Twelve weeks.

DEPARTMENT OF ENTOMOLOGY

ENTOMOLOGY 26 General Entomology I A, D 3 cr

A brief survey of the entire field of entomology: structure, development, classification, biology, and control of insects. Formation of an insect collection.

DEPARTMENT OF FORESTRY AND WILDLIFE MANAGEMENT

FORESTRY 55, 155 The Elements of Forest Mensuration 1 3 Cr

The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data. 3 44-hour weeks.

FORESTRY 78, 178 Harvesting of Forest Products 4 3 Cr

Basic concepts of harvesting methods with emphasis on supervision. Field exercises in harvesting techniques followed by a week's trip visiting industrial forest operations. 3 44-hour weeks.

College of Arts and Sciences

DEPARTMENT OF ART

ART 14 Introduction to Art I C 3 cr

An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles.

ART 33 Basic Drawing I A, B 3 cr

Introduction to drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation.

ART 51 Water Color I D 3 cr

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisites, Art 31, 33.

ART 52 Water Color I D 3 cr

Continuation of Art 51. Prerequisite, Art 51. 6 studio hours.

ART 57 Printmaking I A B 3 cr

Basic study of materials, techniques, aesthetic considerations peculiar to graphic media of lithography and intaglio (etching, aquatint, etc.) permitting students to print their own work. Prerequisites, Art 31, 34, or permission of instructor.

ART 58 Printmaking I A B 3 cr

Continuation of Art 57. Prerequisite, Art 57.

DEPARTMENT OF BOTANY

BOTANY 1 Introductory Botany I B, D 3 cr

Structure, function and reproduction of plants, dealing primarily with the flowering plants. Basic biological principles are emphasized.

DEPARTMENT OF CHEMISTRY

CHEMISTRY 1 General Chemistry I A, D 3 cr

A study of the fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry.

CHEMISTRY 2 General Chemistry II A, D 3 cr

A study of the fundamental chemical laws and theories, with the object of giving the students a sound scientific training through a course in chemistry.

CHEMISTRY 27 Analytical Chemistry II D, E 4 cr

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Not acceptable for major credits except by special arrangement. Prerequisite, Chemistry 2 or 4. (May also be taken as 32 with extra work.)

CHEMISTRY 29 Qualitative Analysis I D 4 cr

The fundamental principles of ionic equilibria and the chemistry of important cations and anions, with particular reference to semimicro qualitative analysis. Prerequisite, Chemistry 2.

CHEMISTRY 33 Organic Chemistry I B, D 4 cr

A short course intended to satisfy the requirements in this field for all students who do not specialize in chemistry. Prerequisites, Chemistry 2.

CHEMISTRY 51 Organic Chemistry I B, D 4 cr

Introduction to the chemistry of carbon compounds. Survey of the

principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 4, 26, 27 or 29.

CHEMISTRY 52 Organic Chemistry II B, D 4 cr

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 4, 26, 27 or 29.

DEPARTMENT OF ECONOMICS

ECONOMICS 25 Elements of Economics I A 3 cr

Definitions, principles of production, exchange, the distributing methods of allocation of income and revenue.

ECONOMICS 26 Problems of the National Economy II A 3 cr

A continuation of Course 25. Current problems, including international economic planning in peace and war. Prerequisite, Economics 25.

ECONOMICS 56 Business Fluctuations and Forecasting I B 3 cr

Nature and causes of business fluctuations; methods of forecasting; government policy for stability; utility of available statistical data as guides to private and public policy. Prerequisites, Economics 25, 53 or Finance 55.

ECONOMICS 73 Modern Economic Theory and Analysis II C 3 cr

Micro-economic analysis: types of markets: applications of linear programming, theory of games and other techniques for rational business planning; balancing forces in free-enterprise economy. Prerequisite, Economics 25.

ECONOMICS 82 Economic Development I C 3cr

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. Prerequisites, Economics 25, 26.

ECONOMICS 84 Comparative Economic Systems II B 3 cr

The structure, operation, and underlying ideology of the major contemporary forms of social-economic organization. Emphasis on the Soviet Union and the United States. Prerequisite, Economics 25.

ECONOMICS 240 History of Economic Thought II D 3 cr

A general study of economic thought from its ancient beginnings; the contributions of the various schools; recent changes in economic thought.

ECONOMICS 291 Seminar on Economic Policy I D 1-3 cr

Selection and application of the tools of economic analysis to major problems of public policy.

DEPARTMENT OF ENGLISH

ENGLISH 1—1 English Composition I A 2 cr
—2 English Composition I B 2 cr

Practice in exposition for college and professional use reinforced by adult readings and an introduction to literary criticism.

ENGLISH 2—1 English Composition II A 2 cr
—2 English Composition II B 2 cr

Continuation of English 1.

ENGLISH 25—1 Masterpieces of Western Literature I A 3 cr
—2 Masterpieces of Western Literature I B 3 cr

An analysis of selected masterpieces designed to enrich the student's appreciation of literary values and to sharpen his understanding of abiding human issues.

ENGLISH 26—1 Masterpieces of Western Literature II A 3 cr
—2 Masterpieces of Western Literature II B 3 cr

Continuation of English 25.

ENGLISH 51 Advanced Expository Writing I C 3 cr

Practice in writing informative and persuasive prose in the form of essays, reports, and news and feature articles. Primary emphasis on clarity and development of style.

ENGLISH 53, 153 Creative Writing I C 3 cr

Intensive practice in writing prose fiction, with some attention to other forms, supplemented by discussion of ideas and techniques in contemporary literature. Prerequisite, a grade of A or B in English 1 or 2, or permission of the instructor.

ENGLISH 57, 157 Major American Writers I B 3 cr

Selected major American writers of the nineteenth and twentieth centuries, including Emerson, Hawthorne, Longfellow, Lowell, James, Adams, Fitzgerald, and Hemingway.

ENGLISH 58, 158 Major American Writers II B 3 cr

Selected major American writers of the nineteenth and twentieth centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Crane, Dreiser, Wolfe, and Faulkner.

ENGLISH 60, 160 History of the English Language II C 3 cr

The development of English, including a study of vocabulary and usage levels, grammars, and dictionaries. Special attention to matters crucial to the teaching of English in secondary schools.

ENGLISH 61, 161 History of English Literature I C 3 cr

A study of the major phases of English literary history. Representative writers from Chaucer to Dryden will be examined.

ENGLISH 67, 167 Shakespeare I B 3 cr

The dramatic art of Shakespeare as revealed in a study of approximately twenty plays.

ENGLISH 69, 169 Renaissance in England I D 3 cr

The non-dramatic literature of Tudor and Jacobean England in terms of emergent forms and literary ideas. Special attention to More, Spenser, Bacon, and Thomas Browne.

ENGLISH 74, 174 Milton II C 3 cr

Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance, with emphasis on *Paradise Lost.*

ENGLISH 77, 177 English Literature of the Eighteenth Century I D 3 cr

The literature of the Augustan Age, with special emphasis on the writings of Swift and Pope.

ENGLISH 78, 178 English Literature of the Eighteenth Century II D 3 cr

The literature of the later eighteenth century with special emphasis on the Johnson Circle. A continuation of English 77 but may be elected independently.

ENGLISH 85, 185 Modern European Drama I B 3 cr

Major modern dramatists beginning with Ibsen and including Chekhov, Pirandello, Strindberg, Giraudoux, Shaw, and others. Emphasis on comparative currents in various European nations.

ENGLISH 87, 187 Modern Novel: 1890-1920 I B 3 cr

The expanding form of the novel and increasing interest in social causes as exhibited in some twelve novels.

ENGLISH 88, 188 Modern Novel: 1920-1950 II B 3 cr

An analytical presentation of some twelve novels. A continuation of English 87 but may be elected independently; no English major may, however, elect both English 87 and 88.

ENGLISH 90, 190 Modern British and American Drama II B 3 cr

A study of representative dramatists since the late nineteenth century, including Shaw, Fry, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art.

ENGLISH 202 Middle English I B 3 cr

A study of the language and chief works in verse and prose, with emphasis on literary developments. (This, or 201, required of all candidates for M.A. or Ph.D. in English)

ENGLISH 203 Elizabethan and Jacobean Drama I D 3 cr

Representative plays by Shakespeare's contemporaries, 1580-1642; special emphasis on works by Marlowe, Jonson, Beaumont and Fletcher, and Ford.

ENGLISH 208 American Literature of the 19th Century II D 3 cr

Readings in the major writers from Freneau and Emerson to Poe and Melville.

ENGLISH 210 20th Century Fiction II E 3 cr

Readings in the major writers from Joyce and Lawrence to Faulkner and Bellow.

ENGLISH 232 Seminar in Robert Frost II C 3 cr

A study of the complete writings and the literary and public career of Robert Frost.

ENGLISH 233 Seminar in American Literature I E 3 cr

DEPARTMENT OF GEOLOGY

GEOLOGY 1 Physical Geology I B, D 3 cr

The nature and origin of the landscape features of the earth, and their underlying rocks and structures; including the work of rivers,

waves and currents, wind, and glaciers; and the role of earthquakes, volcanoes, and the processes of mountain-building.

GEOLOGY 125 Concepts of Earth Science for Teachers I A 3 cr

Evolution of earth and life; basic materials, principles, and methods of study; relation to other sciences; role in modern life; use of maps, specimens, literature, and field studies.

DEPARTMENT OF GERMAN-RUSSIAN

GERMAN 1 Elementary German I A 3 cr

Conversation, reading, grammar, and composition

GERMAN 2 Elementary German II A 3 cr

Conversation, reading, grammar, and composition

GERMAN 7 Intermediate German I B 3 cr

Reading, conversation, composition. Grammar review. Prerequisites, German 1 and 2.

GERMAN 8 Intermediate German II B 3 cr

Reading, conversation, composition. Grammar review. Prerequisites, German 1 and 2.

GERMAN 245 Nihilism and Affirmation in Contemporary Literature I B 3 cr

A study of drama, fiction and essays reflecting the crisis of the modern age, with special emphasis on the period of Expressionism.

GERMAN Graduate Reading Course I C no cr

Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of German required.

RUSSIAN 1 Elementary Russian I B 3 cr

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training.

RUSSIAN 2 Elementary Russian II B 3 cr

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training.

RUSSIAN 7 Intermediate Russian I C 3 cr

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites, Russian 1 and 2.

RUSSIAN 8 Intermediate Russian II C 3 cr

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites, Russian 1 and 2.

DEPARTMENT OF GOVERNMENT

GOVERNMENT 25—1 American Government I B 3 cr
—2 American Government II B 3 cr

A study of the principles, machinery, dynamics, and problems of government in the United States.

Goodell Library

Summertime scene in the north campus area: on right, residence halls

Lounge in the Student Union

The University today: a year-round campus

Machmer Hall, in the central part of campus

GOVERNMENT 26—1 European Government I A 3 cr
—2 European Government II B 3 cr

A survey of the politics and governmental institutions of Great Britain, France, U.S.S.R., and other European countries.

GOVERNMENT 61, 161 Public Administration I C 3 cr

A study of organization and management in modern government, with emphasis on the bureaucracy's role in public policy formation.

GOVERNMENT 66, 166 American Political Thought II A 3 cr

A study of the development of American political thought from colonial times to the present.

GOVERNMENT 72, 172 Modern Political Thought II C 3 cr

The development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present.

GOVERNMENT 95, 195 Seminar I C 3 cr

A study of special problems in the field of government.

GOVERNMENT 96, 196 Seminar II C 3 cr

A study of special problems in the field of government.

GOVERNMENT 200 Special Problems 1 Arrgt. 1-6 cr

GOVERNMENT 293 Seminar on the Government and Politics of South Asia II B 3 cr

Intensive study of selected problems relating to the government and politics of India, Pakistan, and Ceylon.

GOVERNMENT 295 East Asian Foreign Policies I C 3 cr

A study of the foreign policies of China, Japan and other East Asian countries in modern times, and of Western diplomacy in the area.

DEPARTMENT OF HISTORY

HISTORY 5—1 Modern European Civilization I A 3 cr
—2 Modern European Civilization I C 3 cr

The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently.

HISTORY 6—1 Modern European Civilization II A 3 cr
—2 Modern European Civilization II C 3 cr

The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently.

HISTORY 25 The Development of American Civilization I A 3 cr

A survey of the American national growth. Either semester may be elected independently.

HISTORY 26 The Development of American Civilization II A 3 cr

A survey of the American national growth. Either semester may be elected independently.

HISTORY 32 English History I C 3 cr

Emphasis on economic, social, and cultural influences, as well as on constitutional development. Either semester may be elected independently.

HISTORY 55, 155 A History of Russia I A 3 cr

A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. Prerequisites, History 5 and 6.

HISTORY 56, 156 A History of Russia II A 3 cr

A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. Prerequisites, History 5 and 6.

HISTORY 71, 171 The South in American History I C 3 cr

From early settlement to contemporary regional problems.

HISTORY 77, 177 Modern Britain I B 3 cr

A study of selected topics on the political, social, and intellectual development of Britian in the nineteenth and twentieth centuries.

HISTORY 83, 183 The Progressive Age (1900-1920) II C 3 cr

A study of the political response to the changing economic and social conditions in American life.

DEPARTMENT OF MATHEMATICS

MATHEMATICS 1 Introductory Mathematics I II A 3 cr

Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions, algebraically and by the methods of analytic geometry.

MATHEMATICS 2 Introductory Mathematics II I A 3 cr

A terminal course intended for students whose curriculum calls for just one year of mathematics. A continuation of Mathematics 1, including topics from the calculus, statistics, and mathematics of finance. Prerequisite, Mathematics 1.

MATHEMATICS 7 Algebra and Trigonometry II C 3 cr

Fractions, quadratic equations, exponents, logarithms, variation, determinants of the second and third orders, and plane trigonometry.

MATHEMATICS 9 Analytic Geometry and Calculus I II B 3 cr

Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivatives, differentiation of algebraic functions, tangent and normal lines. Prerequisite, Mathematics 7, 07, or high school trigonometry, or Mathematics 07 concurrently.

MATHEMATICS 10 Analytic Geometry and Calculus II I B 3 cr

Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Mathematics 9 and Trigonometry.

MATHEMATICS 85 Introductory Modern Analysis I II B 3 cr

Real and complex numbers. Basic Topology of the real number system. Limit concept and continuity. Differentiation. Partial differentiation. Prerequisite, Mathematics 91.

MATHEMATICS 88 Sets and Ordered Structures I C 3 cr

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic. Prerequisite, Mathematics 85, or permission of instructor.

DEPARTMENT OF MUSIC

MUSIC 1 Music Appreciation—Introduction to Music I A 3 cr

Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and the cultural significance of representative works from the ninth century to the present are studied and discussed.

MUSIC 59 Music History—Music of the 20th Century II C 3 cr

A study of music, both European and American, written since 1900, including Stravinsky, Bartok, Hindemith, Copland, jazz, electronic music. Prerequisite, Music 1.

MUSIC 85 Music Education—Music for Elementary Teachers I E 3 cr

For the classroom teacher having little or no formal training in music. Principles of musical development with particular emphasis on classroom presentation. Rote and reading songs examined; processes of presentation evaluated.

DEPARTMENT OF PHILOSOPHY

PHILOSOPHY 25 Introduction to Philosophy II B 3 cr

An introduction to some of the most important of the general questions, ideas, theories and methods of inquiry which have given direction to Western thought.

PHILOSOPHY 31 Introduction to Logic II A 3 cr

An inquiry into the nature of critical thinking, including (1) the functions of language, (2) the structure of deductive arguments. (3) a glimpse at inductive methods.

PHILOSOPHY 42 Ethics I B 3 cr

An examination of classical and contemporary theories concerning policy formation and the justification of personal decision and ways of life.

PHILOSOPHY 266 Philosophy of Education I C 3 cr

An evaluation of various educational theories and practices on the different levels viewed in the light of historical perspective and contemporary thought. Prerequisite, permission of instructor.

DEPARTMENT OF PHYSICS

PHYSICS 3 Introductory Physics I A, B 4 cr

Mechanics, sound, heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for premedical, predental, preveterinary, and some science major students. Prerequisites, Mathematics 4 previously or concurrently for Physics 3; Physics 3 for Physics 4.

PHYSICS 4 Introductory Physics II A, B 4 cr

Mechanics, sound, heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for premedical, predental, preveterinary, and some science major students. Prerequisites, Mathematics 4 previously or concurrently for Physics 3; Physics 3 for Physics 4.

DEPARTMENT OF PSYCHOLOGY

PSYCHOLOGY 1 General Psychology I B 3 cr

An introduction to the principles and study of behavior. Topics considered include development of behavior, sensation, learning, thinking, motivation, intelligence, attitudes, and personality.

PSYCHOLOGY 50 Elementary Experimental Statistics II C 3 cr

Covers basic concepts and techniques for determining reliability and significance of small samples. Confidence limits: X^2, t, and F tests, and simple regression and correlation.

PSYCHOLOGY 56, 156 Educational Psychology I A 3 cr

Psychological facts and principles of development, learning and measurement as applied to educational situations. Prerequisite, Psychology 1 or 5.

PSYCHOLOGY 65, 165 Child Psychology I C 3 cr

The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice. Prerequisite, Psychology 1 or 5.

PSYCHOLOGY 81, 181 Psychological Tests II A 3 cr

Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationale, construction, characteristics, uses and evaluation are emphasized. Prerequisite, Psychology 1 or 5.

PSYCHOLOGY 83, 183 Abnormal Psychology I B 3 cr

The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics. Prerequisite, Psychology 1 or 5.

DEPARTMENT OF ROMANCE LANGUAGES

French

FRENCH 1 Elementary French I C 3 cr

For those who have had no previous creditable training in French. Intensive practice in the four language skills. Sequence: French 1, 2, 7, 8.

FRENCH 2 Elementary French II A 3 cr

For those who have had no previous creditable training in French. Intensive practice in the four language skills. Sequence: French 1, 2, 7, 8.

FRENCH 7 Intermediate French; French Life and Culture I A 3 cr

An intensive review and study of the language. Readings in modern French literature. Sequence: French 7, 8. Prerequisite, French 2 or equivalent.

FRENCH 8 Intermediate French; French Life and Culture II C 3 cr

A study of some important literary works of the 19th and 20th centuries. Compositions. Prerequisite, French 6 or 7.

FRENCH 58 French Literature of the Nineteenth Century (1964-65) I B 3 cr

A study of the main genres, schools and movements after the Romantic period. Given in alternate years.

Spanish

SPANISH 1 Elemenary Spanish I A 3 cr

For students with no previous creditable training in Spanish. Intensive practice in the language skills.

SPANISH 2 Elementary Spanish II A 3 cr

For students with no previous creditable training in Spanish. Intensive practice in the language skills.

SPANISH 7 Intermediate Spanish: Hispanic Culture I B 3 cr

For upperclassmen who have completed Spanish 1-2, and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts.

SPANISH 8 Intermediate Spanish: Hispanic Culture II B 3 cr

For upperclassmen who have completed Spanish 1-2, and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 8 fulfill the language requirement.

SPANISH 25 Introduction to Spanish Literature I C 3 cr

Selected great works of Spanish literature studied in complete text in literary-historical perspective. Conducted in Spanish. Either semester may be elected independently. Prerequisites, Spanish 8, or permission of the department.

SPANISH 26 Introduction to Spanish Literature I B 3 cr

Selected great works of Spanish literature studied in complete text in literary-historical perspective. Conducted in Spanish. Either semester may be elected independently. Prerequisites, Spanish 8, or permission of the department.

DEPARTMENT OF SOCIOLOGY-ANTHROPOLOGY

SOCIOLOGY 1 Introduction to Sociology I C 3 cr
1 Introduction to Sociology II A 3 cr

A study of the social order, and of the individual considered as a member of his various groups.

SOCIOLOGY 51, 151 Urban Sociology I A 3 cr

A study of urban American social conditions with reference to population, ecology, health, and the classically defined institutional complexes and their problems of adjustment. Prerequisite, Sociology 1.

SOCIOLOGY 56, 156 Race Relations II A 3 cr

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration of similar problems in Africa and Asia. Prerequisite, Sociology 1.

SOCIOLOGY 57, 157 The Family I B 3 cr

The development of the customs of courtship and marriage of the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 1.

SOCIOLOGY 59 Social Stratification II C 3 cr

The factors which make for institutionalized inequality in social life. A consideration of castes and classes in American society. Prerequisite, Sociology 1.

SOCIOLOGY 75, 175 Social Problems II C 3 cr

The incidence, distribution and interrelations among the major types of social tensions in human societies. Various theories of causation. Research projects and field trips. Prerequisite, Sociology 1.

SOCIOLOGY 78 Criminology II B 3 cr

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite, Sociology 1.

SOCIOLOGY 82 Sociological Theory I C 3 cr

An examination of contributions of European and American writers who have concerned themselves with theories of the origin, growth, and development of human social organization. Prerequisite, Sociology 1.

DEPARTMENT OF SPEECH

SPEECH 40 Fundamentals of Stagecraft I D 1 cr

The study of the fundamental principles of construction, rigging, shifting and painting of scenery through lectures, demonstrations and practical laboratory work. Prerequisite: Speech 15.

SPEECH 42 Principles of Stage Make-Up I D 1 cr

The study of the principles of stage make-up through a lecture-demonstration-laboratory practicum. Prerequisite: Speech 15.

SPEECH 73 Fundamentals of Acting Techniques I B 2 cr

The study of the principal techniques of the art of acting with emphasis on individual development; the examination of the basic tenets of this art through practical application and exercises. Prerequisite: Speech 15.

SPEECH 75 Fundamental Techniques of Play Directing I C 2 cr

The study of the fundamental techniques of the art of play directing; the Director's media, the arrangement of the stage picture and production procedures. Prerequisite: Speech 73.

SPEECH 85, 185 Introduction to Speech Pathology I A 3 cr

A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy. Observation; field trips. Prerequisite, Psychology 1.

SPEECH 88, 188 Advanced Clinical Practice I B 3 cr

Advanced training in clinical practice under supervision; special consideration of organic speech disorders. Prerequisite, Speech 82.

DEPARTMENT OF STATISTICS

STATISTICS 21 Elementary Statistics I A 3 cr

The nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation time series.

STATISTICS 51 Elementary Statistics II A 3 cr

The analysis of variance; the design of experiments; sample surveys, multiple regression; non-parametric tests.

STATISTICS 55 Introductory Statistics I C 3 cr

Descriptive statistics; mathematical properties of distribution functions; statistical inference; relationships between variables.

STATISTICS 56 Introductory Statistics II C 3 cr

The analysis of variance; the design of experiments; acceptance sampling; non-parametric inference.

DEPARTMENT OF ZOOLOGY

ZOOLOGY 1 Introductory Zoology II C, D 3 cr

Introduction to the principles of biology with special reference to the cell and its metabolism and to the anatomy, physiology and evolution of the major groups of the animal kingdom.

ZOOLOGY 54 Natural History II D, E 3 cr

Designed to orient the student to features of sky, climate, and terrain, of importance to the teaching naturalist. Methods of identification, collecting data, etc. Prerequisites, Botany 1; Zoology 1.

INTERDEPARTMENTAL COURSES

COMPUTER SCIENCE

COMPUTER SCIENCE 21 Introduction to Automatic Computation I B 1 cr

An introduction to the programming of digital computers. Topics included are basic programming systems, compiler languages, and the logic of programming and compilation. Prerequisite, Mathematics 2 or 4.

COMPUTER SCIENCE Graduate Reading I arrgt. 0 cr

Designed to prepare students for the Tool of Research examination.

School of Business Administration

DEPARTMENT OF ACCOUNTING

ACCOUNTING 25 Introduction to Accounting I I A 3 cr

An introduction to the principles underlying the collection, recording, and interpretation of accounting data.

ACCOUNTING 26 Introduction to Accounting II II A 3 cr

A continuation of Accounting 25 with major emphasis on accounting for corporations, partnerships and manufacturers. Prerequisite, Accounting 25.

ACCOUNTING 63 Cost Accounting I B 3 cr

Basic principles of cost accounting with emphasis on the determination and control of unit costs for materials, labor and overhead under the Job Order and Process cost systems. Prerequisite, Accounting 26.

ACCOUNTING 73 Federal Income Tax Procedure I C 3 cr

A study of federal income tax laws and regulations as they affect individuals; the preparation of tax returns. Prerequisite, Accounting 25 or 27.

DEPARTMENT OF GENERAL BUSINESS AND FINANCE

FINANCE 55 Financial Institutions I B 3 cr

The American financial system and the functional relationships between financial institutions and the economic activities of households, business firms and governmental units. Prerequisites, Economics 25 and Accounting 25 or consent of Instructor.

FINANCE 65 Corporation Finance II B 3 cr

Social significance or corporate financial behavior, internal administration and control, expansion, capital-re-adjustment, and social control. Prerequisite, Accounting 25 or consent of instructor.

FINANCE 76 Life Insurance I A 3 cr

The application of life insurance to the problems of family security, business security, investments, and estate protection.

GENERAL BUSINESS 68 Real Estate II A 3 cr

A comprehensive survey of real estate principles and practices; the mechanics of the real estate market and the economic and legal factors that influence it.

GENERAL BUSINESS 71 Business Law I I A 3 cr

The law of contract and sales.

BUSINESS ADMIN. 200 Problems in Business Administration I arrgt. 3 cr

Independent study and research on selected problems in Business Administration. Permission of the instructor and the dean required.

DEPARTMENT OF MANAGEMENT

MANAGEMENT 61 Principles of Management I B 3 cr

The basic course dealing with the fundamental principles and practices of the managerial process in business enterprises.

MANAGEMENT 64 Personnel Management II B 3 cr

The principles and policies followed by management in the procurement, development, direction and control of personnel.

MANAGEMENT 67, 167 Management-Union Relations I I C 3 cr

A comparison of union-management objectives, functions and structures, including the scope and impact of union penetration into areas of managerial authority. Prerequisites, Management 61, 64, or Economics 79.

MANAGEMENT 92 Problems of Management II C 3 cr

An integrating course dealing with the problems of management embracing the organic management functions, using cases for analysis and systematic decision-making practice. Prerequisites, Management 61, 81, 85.

DEPARTMENT OF MARKETING

MARKETING 53 Marketing Principles I C 3 cr

The problems involved in the distribution of industrial and consumer goods including wholesaling, retailing and sales promotional activities.

MARKETING 54 Salesmanship and Sales Management I A 3 cr

The principles and practices of selling; the management of sales personnel and the control of sales operations.

MARKETING 71 Retailing Principles II C 3 cr

Basic concepts of retailing with case studies of retail management problems.

MARKETING 73 Advertising II A 3 cr

The techniques and media of advertising, its services to business and the organization and economic functions of the advertising industry.

School of Education

EDUCATION 51, 151 History of Education I B 3 cr

Educational movements are traced from early Greece to the present with the aim of better understanding of modern problems.

EDUCATION 52, 152 Principles and Methods of Teaching II C 3 cr

By means of discussion, case studies, and current educational literature, teaching ideals and procedures are set up and applied to the major teaching fields.

EDUCATION 53, 153 Educational Tests and Measurements II B 3 cr

The most serviceable tests for measuring achievement are considered; test construction, administration, scoring, and interpretation of results are studied and applied to the classroom.

EDUCATION 60, 160 Elementary School Curriculum II B 3 cr

The elementary school curriculum from the standpoint of content and methodology. Emphasis placed on the unit method and the activity programs.

EDUCATION 61, 161 Teaching of Elementary Reading and Language Arts II A 3 cr

Discussions and demonstrations of principles and effective practices in the teaching of all phases of the language arts.

EDUCATION 66, 166 Preparation and Use of Audio-Visual Materials II A 3 cr

Study is made of available machines, materials and techniques for teaching groups of students.

EDUCATION 77, 177 Principles of School Guidance II B 3 cr

The need for guidance in the schools, the nature of guidance, and an overview of an adequate guidance service for a school system.

EDUCATION 88, 188 Secondary School Curriculum II B 3 cr

Learning materials and activities and their organization in various teaching fields.

EDUCATION 120 Construction of Audio-Visual Aids I C 2-3 cr

Designed to help teachers and audio-visual specialists to prepare audio-visual materials for use in an educational program. Students will prepare slides, graphics, recordings, still pictures, motion pictures. Prerequisite, Education 166.

EDUCATION 121 Teaching With Television and Radio II B 3 cr

Provides the classroom teacher with an understanding of television and radio so that he can participate in the preparation, utilization, and evaluation of educational programs using these media. Prerequisite, Education 166.

EDUCATION 122 Photography in Education I A 3 cr

Theory and practice of taking and processing photographs for use in educational activities. Prerequisites, Education 120 and 166.

EDUCATION 209 Administering Secondary Schools II A 3 cr

Housing, finance, schedule, the library, guidance, cafeteria, public relations, etc. Prerequisite, teaching experience.

EDUCATION 213 Administering Elementary Schools II C 3 cr

The principal's responsibilities, organization of the school office, scheduling, use of school facilities, curriculum organization, staff relationships, and the place of the school in the community. Prerequisite, teaching experience.

EDUCATION 215-1 Modern Math Workshop I C 3 cr

Practical experiences with small groups of elementary children in the application and adaptation of modern math concepts to classroom instruction.

EDUCATION 215-2 Workshop: Gifted I C 3 cr

Designed to include opportunity for work with selected children of upper elementary levels. Discussion sessions will relate practical experience to theory and to research studies.

EDUCATION 215-3 Workshop: Kindergarten I C 3 cr

Practicum experiences with pre-school children in which students will work in the laboratory school kindergarten preparing materials, and experiencing new methods in teaching the children. Prerequisite: Ed 216-6 or kindergarten teaching experience. Ed 216-6 may be taken concurrently.

EDUCATION 215-4 Workshop: Remedial Reading I C 3 cr

This may be taken in conjunction with Techniques in Remedial Reading (Ed. 265) by a selected group of experienced teachers. It involves working with individual elementary school pupils in the Remedial Reading Clinic. Prerequisite, Ed 160.

EDUCATION 215-5 Laboratory Practicum in Secondary Science II C 3 cr

Provide opportunity for science teachers to obtain first hand experience with the experiments, demonstrations, projects, techniques, and apparatus needed in science teaching, and with appropriate ways of using these.

EDUCATION 216-1 Modern Math for Elementary Schools I B 3 cr

Principles, methods and materials for the teaching of modern mathematical theories and concepts to elementary school children.

EDUCATION 216-2 Seminar: Gifted I B 3 cr

An exploration of various methods of giving enriched academic experiences to the gifted in public schools. Prerequisite, teaching experience.

EDUCATION 216-3 Seminar: Kindergarten I B 3 cr

Research, lectures, demonstration, and group discussions for developing various techniques in the organization and administration of kindergarten education. Prerequisite: Elementary certification.

EDUCATION 216-4 Seminar: Guidance I A 3 cr

Intensive study of the principles and theories of school guidance with an emphasis on discussion groups and individual study for advanced students in guidance.

EDUCATION 216-5 Educational Sociology I A 3 cr

Consideration of basic sociological and anthropological concepts and current studies in terms of their application to the American school system and its problems.

EDUCATION 216-6 School Business and Fiscal Affairs I B 3 cr

The theory and practice of school finance, taxation and educational cost operation, budget planning and accounting, federal, state and local aspects of school finance.

EDUCATION 216-7 Fundamentals of School Administration I A 3 cr

Introductory course for school administration, the relation of public education to the cultural pattern, organization and practices in school administration. Required for program in Education Administration.

EDUCATION 216-8 The Language and Logic of Teaching II A 3 cr

Studies of the limits and resources of language, including considerations of logic, definition, and rhetoric as they apply to teaching.

EDUCATION 216-9—Principles of School Law (Legal Aspects of Education Administration) II B 3 cr

The legal basis of school operation, cases in school law throughout the country, the role of the attorney general and school solicitor in school law interpretation, and school operation in relation to federal, state and local environment.

EDUCATION 230 Comparative Education I C 2-3 cr

Studies of contemporary educational systems in such countries as England, France, Germany, Russia, and Japan. Prerequisite, Education 151.

EDUCATION 240 Occupations and Placement in School Guidance II C 3 cr

The collection, evaluation and use of occupational, educational, and placement information with individuals and groups of students in school guidance.

EDUCATION 242 Elementary School Guidance I B 3 cr

A study of skills, techniques, and objectives of guidance in the elementary school, emphasizing those aspects of guidance of particular interest to the elementary school teacher or guidance person. Prerequisites, Education 177, Psychology 188, and background in Psychology.

EDUCATION 257 Children's Literature II B 2-3 cr

The basic types and foremost works in the literature for children. Attention to different interest and vocabulary levels and to the criteria for selection of lists for individual children. Prerequisite, Education 161.

EDUCATION 263 Diagnosis of Reading Difficulties II A 3 cr

Theory and interpretation of diagnostic procedures to develop a background of information in the diagnosis and treatment of reading difficulties. Prerequisite, Education 161.

EDUCATION 264 Individual Case Studies of Reading Problems II B 3 cr

Practical experience in the gathering and summation of information to form a case study of a child in order to determine the seriousness of the reading problem and the underlying causes and to make recommendations for their correction or remediation. Prerequisite, Education 263.

EDUCATION 265 Techniques in Remedial Reading I B 3 cr

Methods and materials in diagnosis and remedial instruction. Prerequisite, Education 161.

EDUCATION 267 Auto-Instructional Devices and Programmed Learning II C 3 cr

Theory and practice of programmed learning for typical school subjects. Each student will set up objectives and construct a program for a unit of work. Implications for future use in education will be considered. Prerequisite, Education 166.

EDUCATION 283 Comprehensive High School I B 3 cr

Critical study of the historical development, objectives, course offerings, and crucial issues confronting the all-purpose high school. Critical analysis of various suggestions for improvement.

EDUCATION 291 Educational Research II A 3 cr

The principles and methods of research with special emphasis upon the technique used in Education. Statistics are studied chiefly from the standpoint of reporting and understanding the results of research.

School of Engineering

DEPARTMENT OF CHEMICAL ENGINEERING

CHEMICAL ENGINEERING 88—1 Chemical Engineering Laboratory 1 2 cr
—2 Chemical Engineering Laboratory 8 2 cr

Study of pilot plant size equipment illustrating some unit operations. Emphasis on the securing of accurate data, correct operating techniques, and on report writing. Prerequisite, Chemical Engineering 56. 2 3-hour laboratory periods. 3 40-hour weeks.

DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL ENGINEERING 85—1, 2 Electrical Measurements 7 3 cr
—3, 4 Electrical Measurements 8 3 cr

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices. Prerequisite, E. E. 42. 3 40-hour weeks.

DEPARTMENT OF MECHANICAL ENGINEERING

MECHANICAL ENGINEERING 1 Graphics I D 2 cr

The course purpose is to develop a working knowledge of orthographic projection including multi-view drawing, sections, dimensions, pictorial representations. Objectives are met through problem solution and creative work. 2 3-hour laboratory periods.

MECHANICAL ENGINEERING 2 Descriptive Geometry II D 3 cr

The theory of orthographic projection. Geometric concepts of lines, planes, solids; solution of engineering problems involving true sizes, angles and shapes by graphical methods. Prerequisite, Mechanical Engineering 1. 1 class hour, 2 3-hour laboratory periods.

MECHANICAL ENGINEERING 23—1 Materials Processing Laboratory I 7 3 cr
—2 Materials Processing Laboratory I 8 3 cr

A lecture and laboratory course to develop a basic understanding of metal working using cutting and joining processes. Not for Industrial or Mechanical engineers. Offered immediately previous to the fall semester. Prerequisite, Mechanical Engineering 1. 3 40-hour weeks.

MECHANICAL ENGINEERING 25—1, 2 Materials Processing Laboratory II 1 2 cr
—3, 4 Materials Processing Laboratory II 3 2 cr

An understanding of the weldability of metals using manual and automatic processes applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering I. 2½ 30-hour weeks.

MECHANICAL ENGINEERING 26—1 Materials Processing Laboratory III 1 2 cr
—2 Materials Processing Laboratory III 3 2 cr

An understanding of the machining of metals using standard machine tools applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering I. 2½ 30-hour weeks.

MECHANICAL ENGINEERING 63 Engineering Thermodynamics I I B 3 cr

The application of the laws of thermodynamics to various energy-transforming devices, including ideal and actual cycles of steam, internal combustion engines and air compressors. Prerequisites, Physics 5 and 6; Mathematics 30 or 31.

MECHANICAL ENGINEERING 64 Engineering Thermodynamics II II B 3 cr

A study of liquids and vapors, thermodynamic cycles, energy transformations, the transfer of heat plus appropriate problems. Prerequisite, Mechanical Engineering 63.

MECHANICAL ENGINEERING 104 Mechanical Drawing in High Schools 4 3 cr

Course material for pre-engineering high school mechanical drawing courses. Theory and laboratory practice. 3 weeks.

School of Home Economics

FOOD AND NUTRITION 173 Nutrition During Growth and Development 2 cr or 0 cr

Current developments in nutrition education and nutriture of children and adolescents. Interpretation of changing and new concepts, place of school food service in nutrition education.

June 22-July 3. Daily, Monday through Friday, 10-12, 1-3, Skinner Hall.

HOME ECONOMICS EDUCATION 182 Curriculum in Home Economics 1 cr or 0 cr

Development of curricula designed to meet the present-day needs of the secondary student. Important considerations include examination and interpretation of research, a critical evaluation of current offerings in the field, and the responsibility of the teacher for curriculum revision. Prerequisite: Home Economics degree or teaching experience.

June 29-July 3. Daily, Monday through Friday, 9:30-4:30, Skinner Hall.

FOOD AND NUTRITION 191 Institutional Administration 2 cr or 0 cr

Basic policies and theory of management, research findings affecting school food service, control technique and planning developments which influence efficiency of management will be stressed.

July 6-July 17. Daily, Monday through Friday, 10-12, 1-3, Skinner Hall.

TEXTILES, CLOTHING AND RELATED ARTS 210 Socio-Psychological Aspects of Clothing 3 cr or 0 cr

Dr. Ruth Gates, Pennsylvania State University. Explanation of clothing behavior as related to selected theories and methodology derived from the behavioral sciences.

July 6-24. Daily, Monday through Friday, 10-12, 1-3, Skinner Hall.

TEXTILES, CLOTHING AND RELATED ARTS 210 Man and Art 1 cr or 0 cr

A general study of art highlighting man's relationship to art and factors that influence taste formation, particularly related to home furnishings and clothing. Illustrated lectures.

July 27-31. Daily, Monday through Friday, 10-12, 1-3, Skinner Hall.

School of Nursing

NURSING 53 (S) G.N. Principles and Methods of Teaching in Nursing 2 2 cr

An introductory course designed for nurses assuming a teaching role. Two weeks. June 15-26.

NURSING 54 (S) G.N. Interpersonal Relations in Nursing 2 2 cr

A consideration of interpersonal skills in nursing essential for improving nursing practice. Directed clinical practice will be an integral part of the work conference. Two weeks. June 15-26.

NURSING 60 (S) G.N. Principles and Practices of Team Nursing 5 2 cr

An introduction to the team nursing plan of nursing care and principles of leadership essential to effective functioning. June 29-July 10.

School of Physical Education

PHYSICAL EDUCATION 1a, 1b Physical Education I E 2 cr

Aim of the course is to inculcate in the student an adequate knowledge of, a sufficient technique in, and a wholesome attitude toward physical education activities through the medium of individual, dual, and team sports.

PHYSICAL EDUCATION 2a, 2b Physical Education II E 2 cr

Aim of the course is to inculcate in the student an adequate knowledge of, a sufficient technique in, and a wholesome attitude toward physical education activities through the medium of individual, dual, and team sports.

PHYSICAL EDUCATION 31a, 31b Physical Education I E 2 cr

A continuation of Physical Education 1, 2.

PHYSICAL EDUCATION 32a, 32b II E 2 cr

A continuation of Physical Education 31.

PHYSICAL EDUCATION 80 Driver Education Instructor Course I E 3 cr

Driver education and driver training at the instructor's level. Leads to certification as instructor in driver education and driver training.

PHYSICAL EDUCATION 202 Contemporary Problems in Physical Education I C 3 cr

Seminar, review, analysis and evaluation of contemporary problems. A broad review of literature combined with critical analysis of selected items.

PHYSICAL EDUCATION 236 Experimental Physiology of Exercise I B 3 cr

Experimental investigation of the physiological effects of exercise.

WOMEN'S PHYSICAL EDUCATION 1a Physical Education I E 1 cr

Students are required to pass a safety test in swimming. Except for this requirement all unrestricted students may select any activity which is offered. Fall season: archery, field hockey, folk dance, golf, lacrosse, life-saving, modern dance, swimming, tennis, volleyball.

WOMEN'S PHYSICAL EDUCATION 1b Physical Education I E 1 cr

Winter I season: badminton, ballroom dance, basketball, body mechanics, bowling, diving, fencing, folk dance, gymnastics, life-saving, modern dance, swimming, synchronized swimming, tap dance, trampoline, volleyball.

WOMEN'S PHYSICAL EDUCATION 31a, 31b Physical Education I E 1 cr

The seasonal activities for sophomores are the same as in Courses 1a and 1b, 2a and 2b, with emphasis on perfecting techniques rather than learning the elementary skills.

DEPARTMENT OF PUBLIC HEALTH

PUBLIC HEALTH 61 Environmental Health I A 3 cr

The influence of health measures on community welfare with emphasis on man's water, food and air environmental contacts.

Summer Session Features at Other New England Land-Grant Universities

The following special summer courses are available at the institutions listed below:

University of Connecticut (Storrs, Connecticut)

American Maritime History. History 332—A study of the development of American merchant shipping from colonial times and its relationship to American political, economic, and cultural history. Given at Mystic Seaport under joint auspices of the University of Connecticut and the Frank C. Munson Institute of American Maritime History.

Education Workshops

Arts and Crafts
Administrative Science Seminars for:
- Elementary School Principals
- Junior High School Principals
- Secondary School Principals
- School Superintendents

Graduate Industrial Arts Education Program

University of Maine (Orono, Maine)

Field Course in Natural History. Field studies of plants, animals, stars, weather, rocks, and minerals. Special attention to the marine life of the Maine coast. The educational use of natural science information at various grade levels will also be discussed. Three weeks, June 15-July 3, at Goose Cove, Sunset, Maine.

Workshop in Music. Divided into sections for classroom teachers and for specialists to meet the needs of each group. Participants will also have an opportunity to observe or participate in the summer band or chorus. Three weeks, June 15-July 13.

University of New Hampshire (Durham, New Hampshire)

Public Library Techniques. Designed especially for librarians in small public libraries. July 13-21. Non-credit.

Art Workshops. One week sessions. Cover jewelry, weaving, leathercraft, and enameling separately. 1-2 credits.

University of Rhode Island (Kingston, Rhode Island)

20th Annual Art Workshop by the Sea—June 29-August 7.

10th Annual Reading Conference—July 6-July 17.

Chamber Music Workshop—August 2-August 14. Planned for the performance and study of literature for trio, quartet and other string

ensemble combinations at various levels of advancement. Inquiries should be directed to Professor Arnold V. Clair, Chairman, Department of Music, University of Rhode Island, Kingston, Rhode Island

University of Vermont (Burlington, Vermont)

Library Science Courses. School Library Administration, Reference Materials and Teaching, and The Use of Libraries.

Sixth Annual Champlain Shakespeare Festival, August 1-31.

Warren R. Austin Institute in World Understanding — Lectures and discussions by international leaders. July 7-August 14.

For completee information about each of these summer sessions, write directly to the Director of the Summer Session at each institution.

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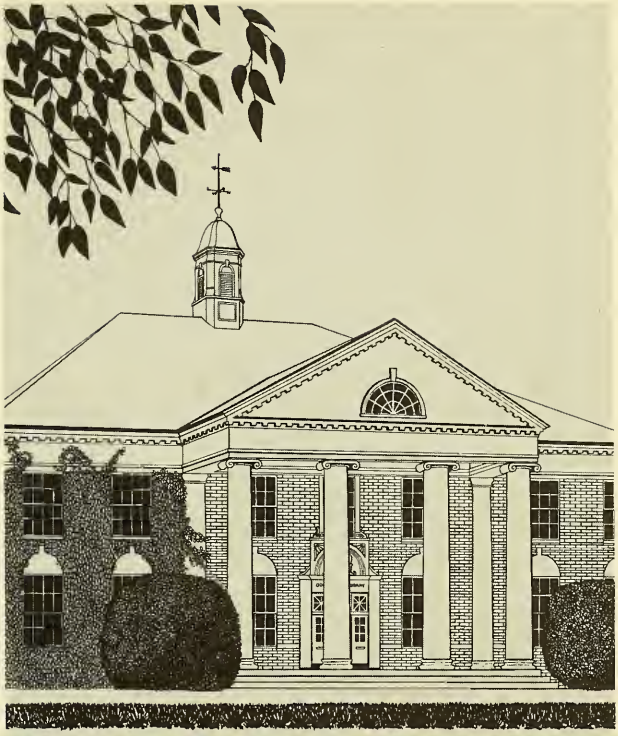
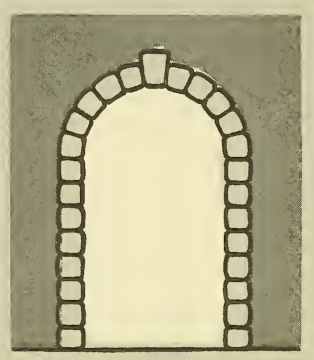


UNIVERSITY OF MASSACHUSETTS BULLETIN

UNDERGRADUATE SCHOOLS | 1964-1965



UNIVERSITY OF MASSACHUSETTS

Amherst

1964-1965

CATALOG OF THE UNIVERSITY

This Catalog of the University of Massachusetts presents announcements concerning its Colleges, Schools and Divisions for the sessions of 1964-1965. The University reserves, for itself and its departments, the right to withdraw or change the announcements made in its Catalog.

VOLUME LVI MARCH, 1964 NUMBER II

Published six times a year by the University of Massachusetts in February, March, August, November (2), and December.

Second class mail privileges authorized at Amherst, Mass.

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Correspondence

Inquiries regarding various phases of the University program should be directed as follows:

Office of the President
JOHN W. LEDERLE

Academic Affairs
Provost's Office

Admission, Registration and Transcripts
WILLIAM D. TUNIS, *Dean of Admissions and Records*

Expenses, Payments
ROBERT H. BRAND, *Associate Treasurer*

Extra-Curricular Activities
WILLIAM D. SCOTT, *Director, Student Union*

Four College Cooperation
Provost's Office

Graduate School
EDWARD C. MOORE, *Dean*

Health Services
ROBERT W. GAGE, M.D.

Housing
JOHN C. WELLES, *Director*

Office of Institutional Studies
LEO REDFERN, *Director*

Loans, Scholarships, Student Employment
ROBERT J. MORRISSEY, *Director, Placement and Financial Aid Services*

Men's Affairs
ROBERT S. HOPKINS, *Dean of Men*

News
DANIEL M. MELLEY, *News Editor*

Publications
WILLIAM DEMINOFF, *Director*

Stockbridge School of Agriculture
FRED P. JEFFREY, *Director*

Student Affairs
WILLIAM F. FIELD, *Dean of Students*

Summer Session
WILLIAM C. VENMAN, *Director*

Veterans' Affairs
GEORGE E. EMERY, *Veterans' Coordinator*

Women's Affairs
HELEN CURTIS, *Dean of Women*

Calendar 1964-1965

SPRING SEMESTER — 1964

January	30	Thursday	Registration.
	31	Friday	Classes begin at 8 a.m.
February	22	Saturday	Holiday, no classes.
March	21	Saturday	Mid-term marks close.
	26	Thursday	Easter recess begins after last class.
April	6	Monday	Classes resume at 8 a.m.
	20	Monday	Holiday, no classes.
May	6	Wednesday	Counseling Day for four-year students.
	14	Thursday	Honors Day.
	21	Thursday	Last day of classes. Saturday class schedule will be followed.
	22	Friday	Final examinations begin at 8 a.m.
	30	Saturday	Holiday, no examinations.
June	1	Monday	Final examinations end at 5:30 p.m.
	5	Friday	Commencement.
	6	Saturday	Commencement.
	7	Sunday	Commencement.

SUMMER SESSIONS — 1964

June	15	Monday	Registration for first six-week session.
	16	Tuesday	Classes begin.
July	24	Friday	Classes end.
	27	Monday	Registration for second six-week session.
	28	Tuesday	Classes begin.
September	4	Friday	Classes end.

FALL SEMESTER — 1964-65

1964

September	14	Monday	Registration.
	15	Tuesday	Classes begin at 8:00 a.m.
October	12	Monday	Holiday.
	31	Saturday	Mid-term marks close.
November	11	Wednesday	Holiday.
	25	Wednesday	Thanksgiving recess begins after last class.
	30	Monday	Classes resume at 8:00 a.m.

December	8	Tuesday	Counseling Day — no 4-year classes.
	19	Saturday	Christmas recess begins after last class.

1965

January	4	Monday	Classes resume at 8:00 a.m.
	13	Wednesday	Classes end.
	15	Friday	Final examinations begin.
	23	Saturday	Final examinations end.

SPRING SEMESTER — 1965

February	2	Tuesday	Registration.
	3	Wednesday	Classes begin at 8:00 a.m.
	19	Friday	Washington's Weekend begins after last class.
	23	Tuesday	Classes resume at 8:00 a.m.
March	20	Saturday	Mid-term marks close.
April	10	Saturday	Spring recess begins after last class.
	20	Tuesday	Classes resume at 8:00 a.m.
	23	Friday	Monday class schedule will be followed.
May	11	Tuesday	Counseling Day — no 4-year classes.
	25	Tuesday	Classes end.
	27	Thursday	Final examinations begin.
	31	Monday	Holiday.
June	5	Saturday	Final examinations end.
	11	Friday	Commencement.
	12	Saturday	Commencement.
	13	Sunday	Commencement.

Trustees of the University

Organization of 1964

Members of the Board	*Term Expires*
J. John Fox of Boston	1965
Miss Victoria Schuck of South Hadley	1965
Dennis Michael Crowley of Boston	1966
Martin Sweig of Winthrop	1966
Frank Learoyd Boyden of Deerfield	1967
George L. Pumphret of Dorchester	1967
Harry Dunlap Brown of North Chatham	1968
John William Haigis, Jr. of Greenfield	1968
Most Reverend Christopher Joseph Weldon of Springfield	1969
Fred C. Emerson of Agawam	1969
Edmund J. Croce of Worcester	1969
Calvin H. Plimpton of Amherst	1969
Hugh Thompson of Milton	1969
Joseph P. Healey of Arlington	1970
Frederick Sherman Troy of Boston	1970
Robert D. Gordon of Lincoln	1971
Louis Martin Lyons of Cambridge	1971

Members Ex Officio

His Excellency Endicott Peabody, *Governor of the Commonwealth.*

John William Lederle, *President of the University.*

Alfred L. Frechette, *Commissioner of Public Health.*

Owen B. Kiernan, *Commissioner of Education.*

Charles Henry McNamara, *Commissioner of Agriculture.*

Harry C. Solomon, *Commissioner, Department of Mental Health.*

Officers of the Board

His Excellency Endicott Peabody, *Governor of the Commonwealth, President.*

Frank Learoyd Boyden of Deerfield, *Chairman.*

Leo Franklyn Redfern of Amherst, *Acting Secretary.*

Kenneth William Johnson of Amherst, *Treasurer.*

General Information

The University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land-Grant Act passed by the United States Congress one year earlier. Now in its second century, the University is a member of the great community of Land-Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry.

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Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was formally opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden structures available for its opening session. Reflecting the broadening interests of its students, the General Court of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

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Situated in one of the most picturesque sections of the state, the University joins with its academic neighbors — Amherst, Smith, and Mount Holyoke Colleges — in maintaining the rich tradition of educational and cultural activity associated with this Connecticut Valley region. The University's central campus consists of approximately 950 acres of land and 100 buildings. Physical growth has been carefully planned, with provisions for additional buildings and facilities to accommodate an enrollment of approximately 20,000 students by 1975. Offering a comprehensive program of instruction and research, the University is thus the Commonwealth's major resource of public higher education dedicated to the preservation and continued development of the country's free institutions.

Branches of Instruction

THE UNDERGRADUATE COLLEGE

The University offers four-year undergraduate instruction leading to the following degrees: Bachelor of Science, Bachelor of Arts, Bachelor of Science in Chemical, Civil, Electrical, Industrial and Mechanical Engineering, and Bachelor of Business Administration.

This instruction is assigned to the College of Agriculture, College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing and Physical Education. The aim of the four-year course is to give as high a degree of proficiency in some particular branch of learning as is possible without sacrificing the breadth, knowledge, and training which should characterize a well-rounded college education.

The Bachelor of Arts degree is conferred upon those candidates who fulfill the requirements for this degree specified by the College of Arts and Sciences and the School of Education. The Bachelor of Science degree is conferred upon those candidates who fulfill the requirements for this degree in the College of Arts and Sciences, the College of Agriculture, the Schools of Home Economics, Nursing, and Physical Education. All graduates from the School of Engineering receive the appropriate degrees of Bachelor of Science in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, or Mechanical Engineering. All graduates from the School of Business Administration receive the degree of Bachelor of Business Administration.

Special arrangements are made for some graduates of county agricultural schools and of agricultural departments of certain high schools to complete the college course with majors in agriculture or horticulture. Upon the completion of their course they are granted a Bachelor of Vocational Agriculture degree.

Undergraduate major programs are available in the following areas:

College of Arts and Sciences

- Art
- Astronomy (Four College Cooperation Program)
- Botany
- Chemistry
- Economics
- English
- French
- Geology
- German
- Government
- History
- Journalism
- Mathematics
- Microbiology
- Music
- Philosophy
- Physics
- Pre-Dental
- Pre-Medical
- Pre-Veterinary
- Psychology
- Russian
- Sociology and Anthropology
- Spanish
- Speech
- Zoology

College of Agriculture

Agricultural and Food Economics
Agricultural Engineering
Animal Sciences
Entomology
Food Science and Technology
Forestry
Landscape Architecture
Plant and Soil Science
Restaurant and Hotel Management
Wildlife and Fisheries Biology

School of Business Administration

Accounting
General Business
Business Administration and Economics
Finance
General Management
Marketing
Personnel Management and Industrial Relations
Production Management
Retailing

School of Education

Education
Elementary Education

School of Engineering

Chemical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering

School of Home Economics

Dietetic and Institutional Administration
Food and Nutrition in Business
Fashion in Retailing and Business
Nursery School Education
Secondary Education and Extension

School of Nursing

Basic Nursing

School of Physical Education

Physical Education for Men
Physical Education for Women
Recreation Leadership

Department of Public Health

Medical Technology
Public Health

THE GRADUATE SCHOOL

Graduate work leading to the Doctor of Philosophy degree may be taken in the following fields: Agronomy, Animal Science, Botany, Chemistry, Civil Engineering, Economics, English, Entomology, Food Science and Technology, French, Geology, German, Government, History, Microbiology, Philosophy, Plant Pathology, Poultry Science, Psychology, Sociology, and Zoology.

A cooperative Ph.D. program involving Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts is also avail-

able in the biological sciences, Chemistry, French, Geology, German and Philosophy.

The School of Education offers several specialized programs leading to the Doctor of Education degree for those employed in the educational field. The requirements for this degree follow closely those outlined for the Doctor of Philosophy degree.

The following departments offer major work leading to a Master's degree: Accounting, Agricultural and Food Economics, Agricultural Engineering, Agronomy, Botany, Business Administration, Chemical Engineering, Chemistry, Civil Engineering, Dairy and Animal Science, Economics, Education, Electrical Engineering, English, Entomology, Finance, Food Science and Technology, Forestry, Geology, German, Government, History, Home Economics, Horticulture, Industrial Engineering, Landscape Architecture, Mathematics, Mechanical Engineering, Microbiology, Philosophy, Physical Education, Physics, Plant Pathology, Poultry Science, Psychology, Public Health, Romance Languages (French and Spanish), Sociology and Anthropology, Speech, Statistics, Wildlife and Fisheries Biology, Zoology.

The general requirements of the Graduate School regarding admission, residence, credits, tuition, etc., together with specific information concerning details of interest to prospective students, are outlined in a separate bulletin, which may be obtained upon request from the Dean of the Graduate School.

SUMMER SESSION

The Summer Session at the University enables a student to earn the equivalent of a full academic year's work in three summers. The Summer Session is open to freshmen who wish to begin their college education immediately upon graduation from high school, thus making it possible to obtain a degree in three calendar years instead of the usual four. For students whose career goals include provision for further education, such as graduate school or professional school, the Summer Session offers an opportunity to reach these goals earlier. Students who are in financial need are encouraged to make use of low cost loans to complete their education. Attendance at the Summer Session offers an opportunity to finish degree work a year earlier at a total cost which is somewhat lower than that incurred in the regular four-year program.

Students who begin their college careers in the summer are advised to plan their programs carefully with the aid of their advisers. Normally, it is wise to plan to take the required courses during the summer, and to take electives and major courses during the fall and spring semesters. Sequential required courses are generally offered during both of the main semesters, so that work begun in the summer can be completed during the fall semester. Similarly, work begun in the spring semester can in most cases be completed in the summer following.

The Summer Session also serves the needs of other groups. Students who are currently enrolled in other colleges can come to the University of Massachusetts to do college work in the summer. Graduate students are offered courses which enable them to continue their education around the calendar. Professional workers are offered courses in their specialized fields. A bulletin describing the entire summer program is available from the Director of the Summer Session.

THE STOCKBRIDGE SCHOOL OF AGRICULTURE

The Stockbridge School of Agriculture, founded in 1918, is part of the College of Agriculture. It is a two-year technical school and offers the associate degree in the following eleven areas: Animal Science, Arboriculture and Park Management, Dairy Technology, Floriculture, Food Distribution, Horticulture, Landscape Operations, Poultry Science, Restaurant and Hotel Management, Turf Management, Vegetable Crops, and Wood Utilization. High school graduates are eligible to apply, and there are no formal entrance tests. Preference is given to students with a good preparation in English, mathematics, and science. A particular effort is made to select applicants who have demonstrated a strong motivation in their major field of interest. On-the-job placement training is required of all students during the summer period between the first and second year. The Stockbridge School issues its own catalogue and a copy may be obtained by writing to the Director of the Stockbridge School of Agriculture, University of Massachusetts, Amherst, Massachusetts.

NEW ENGLAND REGIONAL PROGRAM

The University participates in a cooperative program conducted by the six New England state universities under auspices of the New England Board of Higher Education. Under this program, a student wishing to pursue studies in a major field not offered at his own state university may attend another New England state university at the in-state tuition rate. Information about the program is available in the Office of the Provost.

Admission

WHEN AND HOW TO APPLY

Applications for admission may be obtained by writing the Admissions Office of the University. High School seniors are advised to file their applications early in the senior year. Out-of-state and foreign applications must be received prior to *March 1st* for fall admission. College Board tests should be taken no later than the March testing date. If they are to be considered during the normal processing, in-state applications should be received by *April 1st.* Thereafter, they may be considered only as vacancies occur. An autobiographical letter must be submitted with the application. *There is no application fee required at the University of Massachusetts.*

TESTS REQUIRED

All applicants for admission, except veterans, must take the Senior Scholastic Aptitude Test given by the College Entrance Examination Board. In addition, the University requires three College Board Achievement tests, including English Composition, of every applicant whose scholastic record in grades 9 through 11 contains four or more grades below the college recommending mark of his high school. All *post-graduate* students and *out-of-state* students are also required to submit these three Achievement tests. All College Board test reports must be sent *directly* to the University from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University. Candidates for early admission should, as well, ask the high school to include the junior scores on the application.

CAMPUS VISITATION

The University recognizes the importance of a first-hand acquaintance with the colleges an applicant may be considering and hopes each will find it possible to visit this campus for the applicant's interest and satisfaction. An applicant should be assured, however, that it will in no way disadvantage his application if he is unable to do so. The University holds several Guest Days for high school seniors in the fall. These are particularly appropriate times to visit the campus and high schools are notified concerning them.

An interview is, however, not part of the admissions procedure. It is physically impossible for the admissions staff to interview all applicants. Personal conferences will therefore be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence. If it seems necessary to schedule an admissions counseling conference, the candidate should send his application and academic records to the Admissions Office prior to the visit so that the applicant's situation may be discussed intelligently.

ACKNOWLEDGEMENT AND NOTIFICATION

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

OUT-OF-STATE STUDENTS

The University admits a limited number of well qualified out-of-state applicants. Such candidates should stand in the top quarter of the high school class and be capable of making above average scores on the College Board Scholastic Aptitude and Achievement Tests, all of which are required of out-of-state students.

FINANCIAL AID

Applicants for financial aid must submit a University Financial Aid Application *and* a copy of the College Scholarship Service Form. University applications and information regarding financial aid can be obtained from the Office of Placement and Financial Aid Services at the University. Applications should be completed and returned by March 1 of the current academic year.

ENTRANCE DEFICIENCIES

Candidates who are deficient in one or more subjects required for admission to the University must present records which are otherwise stronger than average. Two years of one foreign language and three years of college preparatory mathematics are required. If accepted, a student deficient in language must take one year of college language for no credit; a student deficient in Algebra II must take a semester of mathematics for no credit. Other mathematics deficiencies must be made up elsewhere prior to admission.

VETERANS

Veterans are not required to take the Scholastic Aptitude test. Instead, they must take entrance examinations in Algebra and English and a College Qualification test. These are administered by the University Testing Service in January, June, and August. Information about these tests will be furnished the veteran at the time he files his application for

admission. Six Months Active Duty for Training students are not considered veterans. They must take the College Board Scholastic Aptitude test rather than the Veterans' Examinations. Veterans in college or in full-time postgraduate studies at present are considered the same as other applicants and do not take the Veterans' Tests.

TRANSFERS

A limited number of transfers from approved colleges may be admitted. Since applicants for such transfer exceed the number that can be accepted, they are placed on a competitive basis. Ratings will be based upon high school and college records and on the College Board Scholastic Aptitude test, which is required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. *Applicants for Transfer Should Write the Admissions Office for A Transfer Application.* At least 45 semester credits taken in residence at the University are required of all transfers who are candidates for the Bachelor's Degree.

HIGH RANKING HIGH SCHOOL JUNIORS

Applicants who have completed with very high academic standing work through the junior year may be admitted to the University for the semester following the junior year. Such applicants must take the Scholastic Aptitude and three achievement tests given by the College Board in May of the junior year and make scores satisfactory to the University. They must be highly recommended by their high school principal. The maturity and social adjustment of the applicant will be considered along with his intellectual development. Such applicants should apply before the end of the junior year.

BACHELOR OF VOCATIONAL AGRICULTURE DEGREE

Superior graduates of vocational schools of agriculture in Massachusetts and vocational agricultural departments in Massachusetts high schools may be accepted for the Degree of Bachelor of Vocational Agriculture, provided:

a. They are unqualifiedly recommended by the Vocational Division of the Department of Education as *bona fide* Vocational Graduates with superior ranks; and

b. That they can present at least 16 units of certified entrance credits, approved as to quality and quantity by the State Department of Vocational Education; and

c. That they successfully pass the English and College Qualification Test administered by the University Guidance Office. Those who have had algebra will be required to include the algebra examination.

SUBJECT REQUIREMENTS

The subjects of preparatory study required for admission call for the satisfactory completion of a four-year high school course or its equivalent and are stated in terms of units. A unit is the equivalent of at least four recitations a week for a school year. High school graduation alone is not sufficient. The applicant's record must indicate capacity for handling the quality of scholastic work which the University has established as its standard of achievement. Sixteen units of secondary school work must be offered, selected according to the following requirements:

College Preparatory Mathematics	3*
English	4
Foreign Language (2 years of 1 language)	2
U. S. History	1
Laboratory Science	1

The remaining units are elective and may be selected from the following subject matter:

a. Mathematics
b. Science
c. Foreign Language
d. History and Social Studies
e. Free electives (not more than four units)

Free elective subjects are those not included in groups a-d, as for example: Music, art, drawing, typewriting, aeronautics, agriculture, home economics, etc. Such free electives are allowed in order that the student who wishes may have some opportunity to elect other high school offerings, while at the same time covering the fundamental requirements for college work.

Students planning to major in the physical sciences and mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half year of trigonometry. Analytical or solid geometry, chemistry, and physics, and an introduction to analytical geometry and calculus are also strongly recommended.

Students planning to pursue an engineering curriculum should offer two years of algebra, one of plane geometry, and one-half year each of trigonometry and solid geometry. Chemistry and physics are also advised. Those deficient in the mathematics requirement should plan to cover it during the summer prior to entrance or expect to take five years to complete the college course.

Candidates of exceptional ability and promise may be considered for admission even though some of the prescribed courses were not included in their high school program.

*Preferably two years of Algebra and one of Plane Geometry.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT

Successful completion in secondary school of courses approved by the College Entrance Examination Board Advanced Placement Program, or the equivalent as approved by the University, will be regarded as meeting the equivalent requirement and will be accorded credit toward graduation.

PHYSICAL EXAMINATION

All students who are entering the University for the first time, and students who are returning after an absence of one semester or more, are required to present health information. Forms for recording details of medical history and details of a physical examination by the student's personal physician will be forwarded shortly after acceptance. In the case of freshmen these must be returned to the University Health Services at least one week prior to the summer counseling appointments. In the case of other students, they must be returned at least two weeks prior to registration. Smallpox vaccination within three years and active tetanus immunization within one year are required as part of the physical examination record. It is recommended that students also be immunized against poliomyelitis and diphtheria.

Expenses

Expenses vary from approximately $1000 to $1200 per year for the normally economical student. First year costs are usually greater than those of the other three years and there is less opportunity for earnings. Therefore, a student is advised to have a definite plan for meeting the expenses of the first year before entering. The following *estimate* of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly college-related and does not include amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year. Tuition for residents of Massachusetts is $200 per year and for others $600.

	Normal
Tuition (citizens of Massachusetts)	$ 200.00
Room in college Residence Hall or private home (approx.)	300.00
Board at college Dining Halls (approx.)	420.00*
Athletic Fee	30.00
Student Union Fee	20.00
Student Activity Tax (approx.)	28.00
Student Health Services Fee	30.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	16.00
Books, stationery, laboratory and other supplies (estimate)	100.00
	$1,144.00

* Above plan for 7 days; 5-day plan available for approximately $340.00 per year or $170.00 per semester.

INITIAL PAYMENT FOR FRESHMEN

The initial payment for first semester expenses required of freshmen at the time of fall registration is indicated below and is made up of the following items:

Tuition (citizens of Massachusetts)	$100.00
Room rent in college Residence Halls (approx.)	150.00
Board at college Dining Halls (approx.)	210.00*
Athletic Fee	15.00
Physical Education Equipment Fee (men only)	10.00
Student Union Fee	10.00
Student Activity Tax (approx.)	14.00
Student Health Services Fee	15.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	16.00
Books, stationery, laboratory and other supplies (estimate)	100.00**
	$640.00

The above are only *approximate* figures. A bill will be rendered to the parent of each student prior to the beginning of the semester.

TUITION

As a state institution the University of Massachusetts offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a "bona fide" residence in the Commonwealth with the intention of continuing to maintain it as such.

The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation the student, in addition to the requirements of these regulations, respecting residence, shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification

* Above plan for 7 days; 5-day plan available for approximately $340.00 per year or $170.00 per semester.

** Students should be prepared to pay cash for books and incidental supplies. Certain departments also make special charges for necessary laboratory supplies. Such charges must be paid prior to registration. Freshmen entering the School of Engineering should be prepared to meet an expense of approximately $45.00 for drawing equipment and slide rule.

of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of the husband. The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

ROOM RENT

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus residence halls. Permission for certain students to commute from their parents' home or to live at sorority or fraternity houses must be obtained from the appropriate student personnel Deans each semester.

BOARD

All freshmen, sophomores, and juniors residing in University residence halls will be required to board at University dining halls. Students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities, upon receiving written permission from their respective student personnel Deans. Those not required to board on campus may eat at the Dining Commons on a cash basis. Weekend board is also available on an optional basis. This plan provides for Saturday breakfast and lunch, and Sunday dinner and supper (holiday weekends excluded).

OTHER FEES AND PAYMENTS

Athletic Fee

Funds received from this charge are used to support comprehensive men's and women's intercollegiate programs as well as fine intramural programs.

Physical Education Equipment Fee

Income from this fee is used for the purchase of all clothing issued to male students for use in the required physical education program, intramural athletics and general recreation.

Student Union Fee

Funds received from this charge are used to support the Student Union and meet the operating costs of its various activities.

Student Activity Tax

This tax, authorized by vote of the undergraduate students with the approval of the Board of Trustees, provides each student with the "Collegian," the student newspaper; "Index," University yearbook; student government, class and other activities.

Health Services Fee

Funds received from this charge are used to support the medical, psychiatric and health services provided by the staff of the Infirmary.

Medical-Surgical Insurance

This is an *optional* plan intended to supplement the care received by students at the Infirmary. It provides hospital, medical and surgical care on a twelve-month basis for injuries or illness during the school year, holidays, summer vacation and other times when the student is away from Amherst. Students who register for the fall semester have only *one opportunity* to enter or reject this program each year, at the time of payment of the fall semester bill. It is also offered on the spring semester bill for new spring registrants only. Married students desiring family coverage under the plan now in existence at the University are advised to contact the Student Health Services.

Admission (Matriculation) Payment

New students are required to make a matriculation payment of $15.00 to the Treasurer of the University as soon as they are notified by the Registrar that they are accepted for admission. Failure to make prompt payment will preclude admission to the University. This payment is not refundable and will be considered as payment for admissions and registration expense if the student does not matriculate. For students who do matriculate, the $15.00 payment will be considered as first payment on University charges, the balance of which will be due prior to September registration. A Certificate of Residence form furnished by the University must be properly filled out by the parent, and the town or city clerk, and returned with the $15.00 advance (matriculation) payment.

Summer Counseling Fee

Members of the incoming freshman class attending the summer counseling program will pay a non-refundable fee to cover the cost of meals, housing, testing and counseling. Full details of the program will be mailed to those who have paid the matriculation fee.

Special Undergraduate Students

The Special Student tuition rate is $10.00 per credit hour for Massachusetts residents, up to a maximum of $100.00, and $30.00 per credit hour for non-residents, up to a maximum of $300.00. All students must pay a $1.00 identification card fee yearly, and students taking three or more *courses* a semester must pay a student union fee of $10.00 and a health fee of $15.00.

Payment Due Dates

In accordance with University policy, all charges for tuition, fees, board and room rent in University Residence Halls are due and payable approximately twenty-one days prior to the date of registration of each semester. Bills will be rendered in advance with due date shown and payment may best be made by mail. Students may not register until all University charges are paid.

Scholarship Payments

It is the responsibility of all scholarship holders to see that the University is adequately notified prior to the time fee bills are prepared. Known scholarships are shown on the fee bills. If such items are not shown, deductions may not be made from the bill until satisfactory evidence has been presented to the Treasurer of the University by the donor.

Late Payment and Registration

Any student who does not make payment of his semester charges by the date specified may be required to pay a late payment fee of $5.00. The process of completing arrangements for housing and board according to schedules set forth by the University is to be considered a part of general registration procedures.

Credit by Special Examination

Students receiving credit by special examination must pay $5.00 per credit before the examination may be taken. This fee is non-refundable.

REFUNDS

Tuition and Fee Refunds

A student who leaves the University for any reason, except as specified below, before a semester is completed will be granted a pro rata refund of tuition and fees. A student who makes an advance payment and then for any reason does not attend any part of the next semester or term at the University will be given a full refund of tuition and fees. The $15.00 admission (matriculation) payment required of new students is not refundable. A student who is involuntarily called

into military service before the completion of a semester will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that semester. If academic credit is given, there will be no refund. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Refund Schedule

Regular Term

a. Within the first two weeks from the beginning of semester or term—(Registration Day) — 80%.
b. During the third week — 60%.
c. During the fourth week — 40%.
d. During the fifth week — 20%.
e. After the fifth week — no refund.

Summer Session

a. During the first week — 60%.
b. During the second week — 20%.
c. After the second week — no refund.

Room Rent Refunds

It is the policy of the University that there will be no refund of prepaid room rent after the semester has begun. A student who has made an advance payment of room rent will be granted a full refund of prepaid room rent if he fails to attend any part of the next semester or term or does not reside in a residence hall or other housing. Students involuntarily called to military service may be granted a refund on a pro rata basis.

Board Refunds

Prepaid board will be refunded on a special pro rata per diem basis. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Financial Aid

LOANS

University Loans

Through the generosity of friends of the University, funds have been donated to provide loans for a limited number of students of the three upper classes to assist in paying tuition or other college expenses. These loans are granted, after proper consideration, to needy students of good scholarship whose habits are economical. All loans are secured by a note endorsed by a responsible party as collateral. In general, if loans are taken out by a senior, they must be paid before graduation; otherwise they are due before the beginning of the next school year. Upon withdrawal from the University, loans automatically become due. On most of the funds, interest is charged at the rate of 3% to maturity and 5% thereafter. Application for loans should be made to the Placement and Financial Aid Services. No loan under this plan will be granted in excess of $200 in any one year. If funds are available at the beginning of the second semester, loans may be made in exceptional cases tc members of the freshman class whose scholastic record is satisfactory and whose budget calculations have been upset through circumstances beyond their control.

Higher Education Loan Plan

Loans up to $500 per year may also be obtained by students in the three upper classes from the bank of their choice through the Higher Education Loan Plan. Certification of attendance and other information relative to the student's over-all record will be submitted to the bank prior to receipt of the loan. Further information can be obtained through the Placement and Financial Aid Services.

National Defense Student Loan Program

Students may borrow up to $1000 per year under this program. Interest at 3% starts one year after completion of the program and is repayable within 10 years. Special consideration in the granting of these loans is given to needy students of superior scholarship who are majoring in engineering or a physical science, studying a modern foreign language, or planning to teach in a public school. Because of the amount of money available, this is necessarily a limited, selective program. Further information and application forms may be secured from the Placement and Financial Aid Services.

Massachusetts Assembly Long-Term Loans

A limited number of loans for college expenses are available to full-time undergraduates of junior and senior standing. Students receiving these loans are expected to be making satisfactory progress toward a degree and should be able to show evidence of needing financial assistance. Payment of these loans may be deferred until after graduation. Interest at three per cent begins on the effective date of the loan and continues until the loan has been repaid in full. Application forms may be obtained at the Office of Placement and Financial Aid Services located in Machmer Hall.

Scholarships

Scholarships are awarded only to needy and deserving students of high character whose habits are economical and whose scholastic records are satisfactory. Scholarships are available to entering freshmen who have made outstanding records in high school. Scholarships are available to upper-classmen who have attained at least a 2.5 cumulative quality point average. Scholarships are paid in installments at the beginning of each semester in the form of a credit on the student's bill. A scholarship may be discontinued at the close of any semester. If the scholarship student withdraws from the University, any refund of University fees or charges must first be applied to reimburse the scholarship fund for the full amount of the scholarship received by the student for the semester. Applications for scholarships may be obtained from the Placement and Financial Aid Services and must be completed and returned by March 1 to be considered. For a detailed listing of available Scholarships see Appendix, Page 223.

PART-TIME EMPLOYMENT

Part-time employment on campus is available, except for freshmen who are not granted part-time work the first semester unless extreme need prevails. Jobs in various categories, both on and off campus, are filled each year. All jobs are cleared through the Placement and Financial Aid Services. Wages vary according to the type of job and the student's past experience; however, those allowed to work should plan to spend no more than ten to fifteen hours per week on such work. In order to give assistance to as many needy students as possible, the maximum wages earned are limited to the equivalent of board. The average earnings of students engaged in part-time work are approximately $200 per year.

VETERANS AND VETERANS' DEPENDENTS BENEFITS

Veterans or dependents of veterans eligible for education and training under the Disabled Veterans Bill 894, the Korean Veterans Bill 550, or

the War Orphan Bill 634 should present a Certificate of Eligibility at registration. Monthly attendance reports to assure payment of benefits are cleared through the Placement and Financial Aid Services. A staff member of these services coordinates all veteran affairs and stands ready to assist in the appropriate clearance and liaison with the Veterans Administration for receipt of benefits and allowances. Veterans who are transferring to the University of Massachusetts from another institution or who have done summer work at another institution will be required to submit a supplemental Certificate of Eligibility at registration. This may be obtained by applying through the veterans' office at the institution last attended.

SPECIAL FINANCIAL AID FOR GRADUATES INTERESTED IN FARMING

The Lotta M. Crabtree Agricultural Funds make available to graduates of the University of Massachusetts funds to be used for farm financing. The purpose of loans from these funds is to assist meritorious graduates who are without means in establishing themselves in agricultural pursuits. These loans are made without interest or service charges other than the cost of title search and legal papers. They must, however, be paid back in full amount within a reasonable length of time and there are certain restrictions on their use. Applications for the "Lotta Crabtree Agricultural Fund" should be addressed to the Trustees of the Lotta M. Crabtree Estate, 619 Washington Street, Boston, Massachusetts, or may be secured at the Placement and Financial Aid Services Office at the University. Decisions regarding the granting of a loan rest entirely with the Trustees under the terms of Miss Crabtree's will.

General Academic Regulations

ATTENDANCE

The attendance of students at all regularly scheduled classes at the University of Massachusetts is expected. No administrative control of attendance is exercised except as hereinafter provided. In cases of illness, students are to explain their absences directly to their instructors. The grade of the student who has met the requirements of the instructor in making up his work shall not be reduced for absence because of illness.

Because the University believes fully in the educational value of outside-of-class activities, including trips which will take students off campus, students are not to be penalized for official absences incurred as a result of such activities. Any student going on such a trip will be entitled to receive make-up work from the instructor in classes missed. If the instructor finds it inconvenient to give a special examination, he has the alternative of not counting the examination missed by the student in computing the final average.

The University has a responsibility for all groups of students who are to be away from their classes or from the University on trips for authorized activities. The person in charge of any such activity involving authorized absence from class shall place the trip announcement on file in the office of the appropriate Dean or Department Head, with a copy to the Schedule Office. The listing shall show the designation of the group or groups to be making the trip, time of departure, destination, and time of return. This information is to be filed at the beginning of the semester for all activities scheduled at that time, otherwise at as early a time during the semester as the information becomes available. In no event should such announcement be later than ten days prior to the day of departure.

Authorization for trips may be made by the Director of Athletics for regularly scheduled athletic events; by the appropriate Student Personnel Dean for extra-curricular trips; and by the Academic Dean or designated Department Head for class trips. For trips extending beyond the normal business hours of the University, a trip list should be submitted to the Office of the Dean of Men for use in case of possible emergencies. This list should include an alphabetical list of student participants, the place at which the event is to be held, the mode of travel, and the name of the instructor or staff member who is to accompany the group. If overnight absence is involved, the place where students are staying is to be indicated in the statement. Students are expected to inform instructors of their absence on authorized trips as soon as the event is announced. Any instructor desiring additional information should make contact directly with the agency authorizing the trip. (No absence or excuse cards will be issued.)

AUTOMOBILES

Only members of the senior class, students 21 years old or over, and commuters are permitted to have automobiles or other types of automotive equipment on the campus or in the Town of Amherst. Vehicles must be registered with the Campus Police. Driving to and from classes is not permitted. Exceptions may be made in the case of an individual who has a severe physical limitation. Requests for such exceptions must be made through the University Health Service.

CONDUCT

The customary high standard of college men and women in honor, self-respect, and consideration for the rights of others constitutes the ideal of student conduct. The privileges of the University may be withdrawn from any student at any time if such action is deemed advisable. It should be understood that the University, acting through its president or any administrative officer designated by him, distinctly reserves the right, not only to suspend or dismiss students, but also to name conditions under which they may remain in the institution. Hazing in the sense of the punishment or humiliation of students is not permitted.

DINING

All freshmen, sophomores and juniors residing in University residence halls will be required to board at University dining halls except that such students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities by permission of the appropriate student personnel dean. University board is optional for seniors and is available on a cash basis.

GRADE REPORTING AND RELATED REGULATIONS

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below.

Grades

Grades shall be reported according to the following letter system. No other interpretation of this letter system shall be authorized.

A — Excellent
B — Good
C — Average
D — Passing (but not satisfactory)
F — Failure
Inc. — Incomplete

The grade of Incomplete shall be reported:

> When a portion of the assigned or required class work has not been completed because of necessary absence of the student, or other reasons equally satisfactory to the instructor. And then only when he considers the work already done to be of passing quality.
>
> When because of serious illness or other cause beyond the control of the student, he is unable to take the final examination. In this case an *Incomplete* is to be given only if the instructor judges that the quality of the student's work is such that by satisfactory performance in the examination he could complete the work of the course with a passing grade. If the student's record is such that he would fail the course regardless of the result of the examination, he is to be given a failure.
>
> A student can obtain credit for an *Incomplete* only by finishing the work of the course before the end of the fourth week of his next semester. A mark of *Incomplete* will be automatically converted to a failure if the course requirement has not been satisfied by this time. The initiative in arranging for the removal of the *Incomplete* rests with the student.

An incomplete in a final grade report is calculated as an F in arriving at a temporary quality point average. When the incomplete is later converted to a grade, the permanent record is changed and the student is notified.

Quality Points

Quality points per semester hour will be assigned as follows: A, 4; B, 3; C, 2; D, 1; F, 0.

Averages will be computed as follows:

Semester Grade Point Average. To compute the semester grade point average, the total points earned will be divided by the total credits carried, which includes the total credits earned and failed.

Cumulative Average. To compute the cumulative grade point average, the total points earned will be divided by the total credits carried, which is the sum of the total credits earned and failed.

Repeated Courses

A course once passed may not be repeated for a higher grade. A student who has received two or more years of language credit in high school may not take the first year of that language for college credit.

Entrance Deficiencies

A student admitted deficient in mathematics (Algebra II) takes Mathematics 01 for no credit. A student deficient in language takes a year of

college language for no credit. Neither of these courses counts in the quality point average.

Semester and cumulative grade point averages will be recorded to one decimal place. At the end of the senior year, the cumulative average for all the student's academic work will be recorded to two decimal places.

In computing grade point averages the following will not be included:

1. Freshmen and sophomore required Physical Education.
2. Courses for which the student does not receive credit toward the degree.
3. Grades not earned at the University.
4. Courses satisfied by advanced placement.

This means that the cumulative credits carried on each semester's grade report do not, necessarily, reflect the credits which have been accrued towards graduation.

Scholastic Warning

A student whose semester average is below the cumulative average required for retention of his class is warned by a statement on the bottom of both his copy and his parents' copy of the grade report. This warning is to indicate that continued below-standard performance may result in failure to graduate or academic dismissal.

Dismissal

Dismissal from the University for scholastic reasons shall be based upon regulations to be administered by the Committee on Admissions and Records. Changes in these regulations may be made by the Faculty Senate and the University faculty. By action of the University Senate, the following cutting points and graduation requirements have been set for the Class of 1964 and thereafter:

1. Graduation Average is 1.80.
2. Second Semester Junior Year, First Semester Senior Year:
   Cumulative Average must be 1.7 unless the Semester Average is 1.8 or better.
3. Second Semester Sophomore Year, First Semester Junior Year:
   Cumulative Average must be 1.6 unless the current Semester Average is 1.7 or better.
4. Second Semester Freshman Year, First Semester Sophomore Year:
   Cumulative Average must be 1.5 unless the current Semester Average is 1.6 or better.
5. First Semester Freshman Year:
   A Student will be dismissed if he has failed three academic courses with a combined aggregate of eight or more semester hours, and has not made a C grade in each of his other academic subjects.

No new quality point hurdle is raised against students at the end of the fall semester: the cutting point in effect for the class at the end of the preceding semester remains in effect for the class until the next requirement takes effect at the end of the academic year.

A student will be dismissed for academic deficiency at the end of seven, eight, or nine semesters if he has failed to satisfy the cutting point requirements of his class set for the seventh semester. A student so dismissed may apply for readmission in the usual way.

A transfer or returning student must satisfy the cumulative quality point average of the class to which he is assigned.

Scholastic Probation

Conditions

A. Students who fail to meet the retention average for their class by not more than one-tenth of a point are designated as being on Scholastic Probation. No academic dismissal is charged. No student is permitted to be on Scholastic Probation for more than one semester.

B. Any student who fails to meet the retention average for his class by more than one-tenth of a point is dismissed and charged with an academic dismissal. He is automatically placed on Scholastic Probation at the time of his readmission.

Eligibility

A. While on Scholastic Probation students shall *not* be eligible to hold office in any recognized student organization, to represent the University in any sense on or off campus, to participate actively in any non-academic extra-curricular activity (including athletic, fraternal, dramatic, musical and publications activities).

B. Scholastic Probation students are not permitted to register a car unless they are commuting from home.

C. The Board of Admissions and Records shall be charged with modifying, extending or limiting the restrictions on a student during his period of Scholastic Probation, and shall report all such modifications to the Faculty Senate periodically.

Termination

A. A full summer session program, normally eleven or twelve semester hours, is considered as one semester's work for purposes of lifting probation.

B. Grades and credits transferred to the University from other institutions shall not normally be considered in reviewing a student's probationary status.

Failures

A failed course in a subject required for the degree must be repeated. If the failed course is not required, a substitution may be made upon the approval of the adviser. Although repeated, the original failed course continues a part of the student's quality point and course record.

Final Examinations

It is University policy not to require a student to take more than two final examinations in one day. When the examination schedule is published, any student who finds himself scheduled for two examinations at the same time or for three examinations on the same day, is to report this situation directly to the University Schedule Office for adjustment.

GRADUATION REQUIREMENTS

It is the responsibility of the individual student to review his own progress toward graduation and the fulfillment of University and school requirements. Through his own initiative, he should address questions concerning these matters to his adviser, Dean or the Registrar.

All four-year curricula of the University conform to the following basic conditions:

Quality Point Average

Beginning with the class of 1964 the graduation requirement is a cumulative average of 1.80. A transfer or returning student must satisfy the cumulative quality point average of the class to which he is assigned.

Accumulated Credits

A. The successful completion of at least 120 semester hours of academic credit. Individual colleges, schools, divisions and departments may require more than 120 semester hours of academic credit. These are exclusive of required physical education courses.

Subject Requirements

B. An introduction to the basic skills of communication by successful completion of English 1 and 2 and Speech 3.

C. An introduction to the humanities by the successful completion of English 25 and 26 (or 27 and 28) and:

(1) Class of 1966 and before:
One other semester-course of three hours of academic credit chosen from art, English (excluding technical writing), foreign-language literature, music and philosophy courses and Speech 51.

(2) Class of 1967 and thereafter:
One of the elective courses (of at least 3 credits) identified by the letter "C" in the university catalogue.

D. (1) Class of 1966 and before:
An introduction to the development of western culture and of the modern social sciences gained through the successful completion of nine semester hours of credit in courses chosen from the offerings of at least two of the following departments: economics, history, government, psychology, and sociology.

(2) Class of 1967 and thereafter:
An introduction to the social and behavioral sciences by the successful completion of three courses (of at least 3 credits each) chosen from those identified by the letter "D" in the university catalogue; and from at least two departments.

E. (1) Class of 1966 and before:
An introduction to mathematics and natural sciences to be achieved by the successful completion of twelve semester hours of credit in courses chosen from the offerings of at least two of the following three broad academic divisions: mathematics, biological sciences, physical sciences and Statistics 21.

(2) Class of 1967 and thereafter:
An introduction to mathematics and the natural sciences by the successful completion of at least four courses (each of at least 3 credits) chosen from those identified by the letter "E" in the university catalogue, and from at least two of these groups: A) logic, mathematics and statistics; B) botany, entomology, microbiology and zoology; and C) astronomy, chemistry, geology and physics.

F. Intensive or specialized work in a particular department, division, school or college constituting a major and consisting of the successful completion of at least fifteen semester hours of credit in junior-senior courses in the area of the major.

A basic physical education course is required of all students. A veteran of two or more years' service is not required to take physical education. "Six Months Active Duty for Training" students are not excused from physical education. A transfer student awarded 15 or more transfer credits must complete the physical education semesters of the class to which he is assigned (i.e. a transfer given 30 transfer credits must complete the sophomore year of physical education.)

All male non-veteran members of the graduating class of 1966 must complete one year of required basic military. Members of the classes of

1963-65 must complete two years of basic military. Students graduating in the class of 1967 and thereafter may elect basic military on a voluntary basis. The basic course carries graduation credit.

Residence Requirements

It is the policy of the University that the final year's scholastic work be accomplished in residence, which is defined for this purpose as continuous enrollment and regular attendance in classes conducted on the campus of the University. This requirement may be waived by the Board of Admissions and Records upon the recommendations of the major department and Dean of the College or School. The Board may also waive the requirement for a student admitted to an appropriate professional school after completion of six or more semesters of work at the University, provided:

1. That the cumulative average at the University has been 2.5 or higher.
2. That satisfactory evidence is presented indicating completion of work comparable to that offered at the University in amount sufficient to satisfy requirements for the appropriate bachelor's degree.
3. That the major department and Dean of the College or School approve.

No student is allowed more than ten semesters, including semesters at other colleges, to attain the required graduation average. Twelve semester credits earned in summer schools at the University or other colleges constitute a semester. A student who has met the required graduation average but is deficient in course requirements may continue for one additional semester (total 11).

Financial Requirements

Diplomas, transcripts of record, and letters of honorable dismissal will be withheld from all students who have not paid all bills and all loans due the University. All such bills due the University must be paid ten days preceding Commencement. If paid after that date and the student is otherwise eligible, he may graduate the following year.

HONORS

A. *University Honors Groups.* At the beginning of each semester a list is posted of those students who, during the previous semester, made a semester grade point average of 3.0 or higher. Three groups are recognized as follows:

First Honors . . . . . 3.8 (3.75) or higher
Second Honors . . . . . 3.4 (3.35) to 3.7 (3.74) inclusive
Third Honors . . . . . 3.0 (2.95) to 3.3 (3.34) inclusive

B. *Graduation with Distinction.* High ranking students will be graduated as follows:

Summa Cum Laude — Cumulative average 3.80 or higher.
Magna Cum Laude — Cumulative average 3.40 to 3.79 inclusive.
Cum Laude — Cumulative average 3.00 to 3.39 inclusive.

A transfer, to be eligible for consideration for graduation with distinction, must have earned his final 60 semester hours of credit in residence at the University.

REPORTS

A. Mid-Semester Report:
Freshman and sophomore mid-semester reports are given to students by advisers and also sent home each semester. No mid-semester reports are prepared for juniors and seniors.

B. Final Grades:
First semester; given to students before being sent home.
Second semester; mailed to homes.

TRANSCRIPTS

Two transcripts of a student's record will be furnished without cost by the Registrar's Office. For each additional copy there will be a charge of $1.

REGISTRATION

Pre-Registration

Every student must report for pre-registration on the appointed day. Late pre-registrations will be charged a fee of $5. A student who does not pre-register is not assured admission into the next semester.

Registration

Each student must report for registration on the appointed day. Late registrants must pay a $5 fine.

Course Registration

No course will be recorded on the permanent records of the University nor will a student receive credit for it unless he has registered for such a course in accordance with established procedure on a regularly

scheduled registration day or unless his registration shall have been made official by the signature of the Registrar. In the latter case a Program Change Card must be signed by the student's adviser and the Registrar approving the course, and by the instructors of the courses to be dropped and added. No instructor should allow a student to enter his class unless the student was officially enrolled on a regularly scheduled registration day or submits such a Program Change Card authorizing his admission to the class. A student may not drop a course without the approval of his adviser and the Registrar on a Program Change Card and the release of the instructor. A course dropped without this approval will be recorded as a Failure.

COURSE ENROLLMENT AND WITHDRAWALS

A. *General Regulations*

1. *Course Loads*
   Regular students will carry a minimum of twelve semester hours of credit (freshmen, eleven). Only students of high academic standing (cumulative average of 2.5 and above) will be permitted to take an overload of one course with the approval of the academic dean involved and of two courses with the approval of the dean and the Provost. Approval forms are available in the Office of the Registrar. Seniors in their final semester may carry as few courses as necessary to graduate or may carry an overload of up to two courses without special permission if such an overload will enable them to graduate.

2. *Certification of Course Changes*
   To add, drop, or change a course, the student must obtain the written approval of the instructors concerned, the faculty advisor, and the appropriate officer in the Registrar's Office. Signed cards are to be filed with the Registrar. Instructors and advisors are referred to the *Manual for Faculty Advisers* for specific information.

3. *Exceptions to the Regulations*
   Exceptions to the regulations below are made only in cases of protracted illness or serious personal or social problems, and then only with the approval of the Provost and the appropriate one of the following: Health Service, Deans of Men, Women, or Students, Counseling and Guidance Office, or the Dean of the School or College concerned.

B. *Withdrawal from Courses*

Period 1. (Up to and including ten academic days from the be-

ginning of a semester): Within this period a student may add, drop, or substitute a course without penalty and without notation on his record. No courses may be added after Period 1.

Period 2. (Closes six academic days beyond closing date for mid-semester grades established in the University calendar): Subject to the general regulations above, a student may drop courses without penalty. A *W* will be noted on his record to indicate these withdrawals.

Period 3. (Period between the end of Period 2 and the end of the semester). Subject to the general regulations, a student may not drop a course without penalty. *WF* is entered on his grade at the time of withdrawal. This grade will be figured in the cumulative average.

C. *Withdrawal from the University*

During Periods 1 and 2 a student may withdraw from the University without penalty. Grades of *W* will be noted on his record. The portion of the semester will not count as one of the ten semesters permitted toward graduation.

After Period 2, grades of *WF* or *WP* will be entered for all courses in which the student is enrolled at the time. The *WFs* will count in the cumulative average. The semester will count as one of the ten semesters permitted for graduation.

Change of Major

A student wishing to change his major must get a Major Change Card at the Registrar's Office. This change is to be approved by the head of the Department or School in which he is now majoring and also by his new major adviser. This card, properly endorsed, must be returned to the Registrar's Office before the change receives final approval. As part of the major change procedure, the student takes his Academic Records Folder to the new department.

SPECIAL COURSE REGISTRATION

Advanced Placement

If a student is given advanced placement by a placement examination or by some other means, and if he completes the advanced work (the next course when the courses are in sequence) with a grade of C or better, he will be given credit but no grade for the omitted work. If the grade in the advanced work is D, he will be considered to have completed any requirement represented by the omitted work but will not receive credit for the omitted work. Credit with no grade awarded in

this manner will be treated as transfer credit in the computation of quality-point averages.

Auditing

A full-time undergraduate student may audit a course by presenting his ID card to the instructor of the course, providing that the instructor can accommodate the auditor in his class, feels that the student has sound academic reasons for the audit and that the student has the proper preparation. The student will be expected to pay laboratory fees, where applicable.

Credit by Special Examination

The requirements of any course approved for credit may be met by examination upon arrangement with the Dean of the School or College and the head of the department offering the course, provided the student's quality point average is 2.5 or higher. All such arrangements must be completed prior to the mid-semester. No student may earn more than thirty (30) semester hours of credit in this manner.

Credit for Work Completed at Foreign Institutions or in Military Service

Students seeking credit for work taken at foreign colleges or for service-connected educational experiences must apply in writing to the Dean of the College or School in which they are enrolled. Credit may be granted for such work upon approval of the department concerned in each case. No student will be automatically credited for any specific course. Each case must be decided according to appropriate criteria applied by the department concerned.

Four College Courses

The University shares with nearby Smith, Mount Holyoke, and Amherst Colleges an exchange course program for *advanced and outstanding students*. With the permission of the student's Adviser, Department Head, and the Provost, enrollment may be made in an advanced course in the student's major which is *not available at the University*, which is associated with the student's career goals, and which is vital to the student's education. Mutually acceptable arrangements among the four colleges have been made concerning costs and transportation. Applications are available at the Provost's Office and must be completed at or prior to Counseling Day.

RESIDENCE

Student Housing Policy

It is the policy of the Board of Trustees that all men and women

undergraduate students shall be housed in University residence halls. Permission for certain students to commute from parents' home or to live at sorority or fraternity houses must be obtained from the appropriate student personnel dean. Students who are assigned to housing operated by the University are expected to remain in occupancy for the academic year and may not be released sooner except as their places are taken by suitable substitutes. The University of Massachusetts reserves the right to change room assignments whenever necessary. Most residence hall rooms are double and are furnished with beds, mattresses, desks, chairs, and a chest of drawers. Students care for their own rooms and are responsible for any damage.

Residence halls will be open for occupancy on the day immediately preceding the opening of the University. All student property must be removed from the rooms and the key turned in immediately after final examination in June. Such property not removed by the owner will be removed by the University and stored at the owner's expense. Students assigned to residence hall rooms will be responsible for the room rent of the entire semester. Room rent is not refundable. Room rental charges do not include the several regular school vacation periods. The University reserves the right to utilize student rooms during vacations for conferences and other groups which meet occasionally on the campus.

Student Room Assignments

Assignment of rooms in all residence halls is under the supervision of the Housing Office. Requests for permission from male students to live off campus must be made in writing to the Dean of Men.

Full time Heads of Residence who are members of the professional staff of the Dean of Women's and Dean of Men's Offices are in charge of each residence hall. While these Heads of Residence are responsible for the enforcement of University rules and regulations, their primary concern is to counsel students. In each residence hall they are assisted by Floor Counselors in maintaining good living and study habits. Residence halls are governed by an elected Student House Council, advised by the Head of Residence, a procedure which gives the students valuable training in dealing with the problems of group living.

Freshmen will be assigned rooms in the residence hall and will be notified of the assignment prior to the beginning of college. In the spring of each year, upperclass students have an opportunity to choose rooms for the coming year.

Only students living in their own homes may commute. Upperclass women may apply to the Dean of Women for permission to live in a sorority house, or to earn room and board in a private home. Residence halls are maintained for undergraduates; graduate women from other countries are also accommodated whenever possible. The Dean of Women's Office maintains a list of rooms in Amherst available for graduate women students.

Apartments for Married Students

The University owns and operates two groups of apartments: Lincoln Apartments for junior faculty, graduate and undergraduate students, and County Circle apartments for graduate and undergraduate students. Apartments are unfurnished with the exception of kitchen units which contain an electric range and refrigerator. Apartments are assigned as of date of availability. New junior faculty, married graduate students and undergraduate students with children receive consideration in that order.

Every effort is made to assist applicants in obtaining housing either on or off campus. Listings of off campus housing are available at the Housing Office. Due to daily changes in these listings and the fact that all off campus arrangements must be made by the parties involved, these listings cannot be given out except on a personal visit. Further information and applications may be obtained from the University Housing Office, Draper Hall.

Insurance

It is not possible for the University to carry insurance which will compensate students or their families for losses suffered on the campus due to such hazards as fire, theft, water damage, etc. For most families such insurance is highly desirable, either as an extension of your present home insurance or as a special contract.

General Services

UNIVERSITY LIBRARY

The University Library now consists of the Goodell Library built in 1935 together with a new library addition of seven floors completed in September 1959 which is twice the size of the original library building. The library complex will provide space for the future expansion of the book collection to 460,000 volumes. Seating capacity is provided for 1350 readers and includes special study areas and reading rooms. The present book collection exceeds 270,000 volumes in the University Library and the 19 departmental and laboratory libraries. Facilities in the University Library include rooms for reference materials and current periodicals, a rare book room, an extensive microfilm collection, microfilm reading units, a map room, an exhibition area, and a typing room for researchers. The University Library is also a depository for the publications of the United States Government as well as the State Agricultural Experiment Stations.

HAMPSHIRE INTER-LIBRARY CENTER

The University Library is a participating member of the Hampshire Inter-Library Center, a cooperative facility for the acquisition, storage and servicing of research materials, especially journals, documents and reference sets. Incorporated in 1951 to augment library resources in the area, HILC is jointly operated by the four Connecticut Valley colleges — Amherst, Mount Holyoke, Smith, and the University of Massachusetts — and the Forbes Library of Northampton, Massachusetts. The collection numbers more than 21,000 volumes; some 600 journals are received currently. The Center is located on the second level of the new addition to the University Library.

ALUMNI ASSOCIATION

The Associate Alumni is the general alumni organization of the University of Massachusetts. The association maintains headquarters at Memorial Hall, erected by alumni and friends in honor of those men of the University who died in World War I. The association publishes a magazine, *The Massachusetts Alumnus*, as the alumni publication of the University. According to its by-laws, the corporation is constituted

for the purpose of promoting the general usefulness of the University of Massachusetts; of cultivating mutual regard among its graduates and former students; and of strengthening their attachment to their Alma Mater. Under sponsorship of the University of Massachusetts Building Association, composed of alumni who volunteered their services, 19 dormitories, two faculty apartment centers, and a Student Union Building have been constructed on the campus. The governing body of the Associate Alumni consists of its officers and a board of directors. Four directors are elected each year and serve a term of four years. All graduating seniors become members of, and contributors to, the association at graduation, according to a tradition set by the Class of 1940.

AUDIOVISUAL CENTER

The Audiovisual Center is organized and equipped to aid the professional staff with audiovisual equipment and materials. The Center is located in the north patio level of the School of Education. Libraries of motion pictures, filmstrips and slides are maintained. Major types of audiovisual machines are available on short-term loan for classroom teaching. Machines permanently located in various buildings are maintained and repaired. Assistance is available in the preparation of charts, graphs, maps, and diagrams. Photographic and diazo reproductions are made on paper or in the form of transparencies. Recordings can be made or reproduced.

MASSACHUSETTS EXPERIMENT STATION

Making science useful for the improvement of agricultural industry continues to be the primary responsibility of the Massachusetts Experiment Station established by the state legislature in 1887. Basic scientific investigation is conducted to find satisfactory solutions to the problems involved in the production, processing and marketing of food and other agricultural products. A large part of the work of the staff centers around research in biochemistry, plant pathology, genetics, microbiology, soils, plant physiology, animal physiology and veterinary science, forestry, entomology and food technology. Engineering research to develop new and improved methods and techniques for the processing and marketing of food, flowers and nursery crops is an important part of the Experiment Station program.

Economic research is conducted to provide new knowledge upon which to base management decisions by firms in the agricultural industries and public policy decisions relating to natural resources, agriculture and the food supply. Increasing attention is being given to studies of future needs in land and water resources and to research useful in increasing the efficiency of the region's food marketing system.

The science center (Field Station) at Waltham is a part of the Experiment Station established and maintained by the University to serve

the people of the state through scientific investigation in the biological fields considered as "plant science." Problems involved in the genetics, culture, disease and pest control of flowers, vegetables and ornamental plants receive major emphasis. Similar research, but directed at the specific problems of the cranberry industry, is carried on at the Cranberry Research Station in East Wareham.

PUBLIC SERVICE AND REGULATORY ACTIVITIES

In addition to its research responsibilities the Massachusetts Experiment Station carries on many public service activities and administers statutory regulations pertaining to the sale of feeds, fertilizers, seeds and the use of milk testing glassware. These duties have been assigned by the state legislature to the Experiment Station which is equipped with the necessary laboratories and scientific personnel.

COOPERATIVE EXTENSION SERVICE

The Massachusetts Extension Service conducts educational programs for adults and off-campus youth (4-H) in agriculture and home economics. These programs help people apply scientific and research information in solving problems. Programs are conducted in farm production, food processing, food distribution and other types of agricultural business, with homemakers and with other groups interested in family living, the development of youth, use of agricultural resources, and our rural communities. As such, the Extension Service is a cooperative teaching effort of the United States Department of Agriculture, University of Massachusetts and the several counties of the state. Many staff members in a wide range of fields at the University of Massachusetts participate in extension education, as well as research and resident teaching. County Extension workers cooperate with University personnel in planning and conducting the work. A variety of educational techniques and communications media are used.

BUREAU OF GOVERNMENT RESEARCH

The Bureau of Government Research was established at the University of Massachusetts in 1955. The Bureau is staffed by professional personnel experienced in local government research. Its work consists of research in governmental problems, publication of studies in public administration, conducting training institutes for public officials, providing consultative services to cities and towns, and the maintenance of a research library.

THE MASSACHUSETTS POPULATION RESEARCH INSTITUTE

The Massachusetts Population Research Institute, established in

September, 1961 by the Department of Sociology and Anthropology, has a twofold purpose: (1) to serve as a center for the analysis of the structure of and changes in contemporary Massachusetts population; and (2) to provide training for undergraduate and graduate students in the techniques of demographic analysis. The Institute publishes a series of working papers on the major aspects of Massachusetts demographic structure.

OFFICE OF INSTITUTIONAL STUDIES

The Office of Institutional Studies is established to collate materials and information on the University of Massachusetts and institutions of higher education in general. It provides a library of published information on higher education, including studies done at other institutions. It serves as a clearing house for information on our own institutional growth and development; and it undertakes to assist faculty and administration in the continuing analysis of our institutional practices.

PUBLICATIONS AND NEWS OFFICE

The University recognizes its obligation to provide the public with accurate information about its educational program. With rising public interest in higher education, information about the University is sought by all communications media, including the daily and weekly press, radio and television. In addition to providing information through mass media, the Publications and News Office maintains contacts with institutions of higher learning throughout the country through exchange of information in professional journals and publications of educational societies. Daily training in news writing is provided for a limited number of students who report on University activities and prepare copy for general news releases. The catalogues of the University and other important publications are edited in the Publications and News Office.

SPEECH AND HEARING CENTER

The Center's services are available for rehabilitation of adults with speech and hearing problems which may affect vocational and professional performances and placement. Illustrative clients at present include stutterers, and people with voice problems, hearing loss, and aphasia. These include both men and women from surrounding communities who have been given released time from their workday for receiving speech therapy. No fees are charged. Cooperative planning with the Massachusetts Rehabilitation Commission is also available for vocational placement. Consultation service is also available for public schools conducting speech surveys. No fee is charged. The Center's present activities include institute-workshops for school administrators in speech surveys and organization of public school speech and hearing

programs. The workshops are held on campus with demonstrations in Speech and Hearing Center facilities. Similar workshops for industrial management can also be arranged without fee.

PROGRAM IN URBAN AND REGIONAL PROBLEMS

The problems associated with large numbers of people living together in small geographical areas involve many traditional academic disciplines. The departments listed below have developed cooperatively a curriculum for students who have an interest in applying the knowledge of their major to the problems of cities and their effects on adjacent suburban and rural areas. Interested students can obtain information from the following cooperating departments: Agricultural Economics, Civil Engineering, General Business and Finance, Government, Landscape Architecture, Sociology.

INSTITUTES AND OTHER RESEARCH FACILITIES

The University maintains major scientific institutes and other research facilities for the advancement of knowledge in various fields.

The Polymer Research Institute carries on a program of advanced studies directed toward gaining greater understanding of the chemistry of plastics. Research is conducted to find better methods for studying the properties of plastic films, fibers and rubbers, and for establishing a relationship between the structure and properties of these materials.

The *Institute of Agricultural and Industrial Microbiology* is presently engaged in research regarding the use of microorganisms in the production and processing of agricultural and industrial products such as foods and fibers and the control of microorganisms harmful to man and his environment.

The *Institute of Environmental Psychophysiology* has been established for long-range studies of the effects of technological and natural stress factors on the health, safety and efficiency of persons working in various industrial and other settings.

Important to the many research projects undertaken on a continuing basis at the University is the *Research Computing Center* housing computer apparatus and peripheral equipment needed for rapid solution of mathematical and statistical problems associated with such projects. The University also has a subcritical nuclear reactor, electron microscope and other important scientific equipment for use in modern research.

Services to Students

ACADEMIC PROGRAMS FOR SUPERIOR STUDENTS

The University provides superior students with challenging educational opportunities beyond those normally encountered in the regular four-year curricula. A flexible program of honors work, intended to develop and expand the potential of academically gifted students, is offered in the following areas.

Freshman, Sophomore, and Junior Honors Colloquia

Honors Colloquia provide students of outstanding talent an opportunity to work in small inter-disciplinary groups of ten students and two professors from all colleges and departments of the University. Reading lists of widely-selected materials and discussion emphasize breadth of learning, the ability to make significant personal investigations, to communicate ideas effectively orally and in writing, and to defend these under critical examination of the group. Each student works under close supervision of the two instructors. To provide an extension of the student's viewpoints in areas other than his own, and to expand the scope of his work rather than emphasize intensive study of one field, as is done in senior honors, assigned readings treat topics of broad, central concern which cut across several disciplines and fields, demonstrate the unity of knowledge, and lend experience in intellectual inquiry, analysis, and synthesis. Several academic privileges are accorded Honors Colloquia members, and one credit per semester is granted.

Senior Departmental Honors

Departmental Honors are designed to recognize merit and give highly qualified students time and opportunity for independent study under closer, more personal direction than is ordinarily provided in the University curriculum. Such study shall be devoted to a careful exploration of some question, problem or theme of significance within the student's major field. The ultimate aim of Departmental Honors is to afford talented students maximum freedom to develop their powers of initiative and resourcefulness and greater freedom to make at least a beginning in original, contributive research. To be eligible for admission to Departmental Honors, a student should have a scholastic record of 3.0 or higher for the first five semesters of college work and demonstrate outstanding promise in his major field. In exceptional cases students who have averages lower than 3.0 but show unusual aptitude for independent work may be accepted if a written statement establishing this

is presented to the Director of Honors. Departmental Honors candidates are assigned an advisor who supervises the preparation of the thesis to be submitted to his department and to the Honors Council. The candidate also presents an oral defense of his thesis. If by the excellence of his work he satisfies all the requirements of his department and the Honors Council, the candidate is awarded honors in the field of his specialization upon graduation. During the senior year, independent study is carried forward each semester as a three-credit course in the department of the major. Senior Honors students have the privilege of enrolling in courses normally limited to graduate students. By permission of the head of the department of their major, Senior Honors students may gain admission to the Graduate School of the University and enroll in courses for graduate credit, provided requirements for the baccalaureate are separately fulfilled.

Opportunities for Independent Study

Students majoring in the College of Arts and Sciences who have a cumulative quality point average of 3.0 or better may, upon the recommendation of their major department, the Honors Council, and the approval of the Dean, pursue special courses of study during the senior year. The program must be the equivalent of thirty semester hours of credit, and students electing such programs will be granted release from other formal requirements of the senior year.

FOUR COLLEGE COOPERATION

Amherst, Mount Holyoke, and Smith Colleges and the University of Massachusetts have for some time combined their academic activities in certain selected areas for purposes of extending and enriching their collective educational resources. Under this cooperative program, a student in any one of the four institutions may enroll in courses given at the other three if he has the necessary qualifications and the approval of the Dean or Provost of his own institution. See "Course Registration," Page 38.

The oldest and perhaps most important of the Four College cooperative ventures is the Hampshire Inter-Library Center, a separate legal entity with a Board of Directors composed of the four Presidents, the four Librarians, and representatives from each of the Faculties. HILC is a depository for research materials and learned periodicals of a kind and in a quantity well beyond the reach of any one of the four libraries operating independently. The Center is now located on the University campus in the new addition to Goodell Library.

An FM radio station, WFCR (88.5), is similarly a Four College activity, operating as a legal entity under a Board of Directors made up of representatives of the four institutions. Other cooperative activities, all designed to give added strength in one way or another to each

institution, include: a joint astronomy department; new courses in the history of science; new courses in non-Western studies, financed for three years by the Ford Foundation; a Ph.D. program; a Film Center; a common calendar of lectures and concerts on all four campuses; and a committee on transportation. Additional cooperative projects are in the planning stage. The entire program is under the supervision of a Coordinator who is a member of the administration of all four institutions.

THE STUDENT UNION

The Student Union is the community center for all members of the University family — students, faculty, administration, alumni, and guests. It is not just a building: it is an organization and a program which together constitute a well-defined plan for a fruitful community life on campus.

Constructed in 1957 by the University of Massachusetts Building Association, the Union is the center not only of major social activities, but also of many other organized endeavors forming an important adjunct program in the general educational process of the University as a whole.

Thus, the Union houses the offices of the Coordinator of Student Activities, R.S.O. Business Manager, University and Student Union Program offices, student publications, the Chaplains, and the Student Senate. Service departments of the Union include: the University Store, carrying a complete stock of books and student supplies; the Union Food Service, providing snacks and lunches or catered meals; the Games Area, with bowling, billiards, table tennis and other table games; the seven-chair Barber Shop; and the Lobby Counter, the Union's general service facility (newspaper stand, box office, check-cashing service, record lending library, lost and found information desk).

Three large lounges — the Cape Cod, Colonial, and Governor's — are available for reading and conversation. There is also a Music Room, for listening or piano practice; a Reading Room, containing home-town newspapers and periodicals; and ten Meeting Rooms for use by campus organizations.

Student Union program activities are selected, planned and executed by the Student Union Program committees. These groups are composed of interested volunteer students, and their activities are coordinated by a full-time Program Adviser.

The construction cost of the Student Union is being defrayed by a Student Union Fee of $10 per student per semester. The excess of student fees over the bond schedule, plus revenue earnings, compose the operating fund for the Union building.

DISTINGUISHED LECTURESHIPS, SEMINARS, COLLOQUIA

Each year the University brings distinguished personages to the campus to lecture on topics of major significance in the arts, sciences, public affairs, and other areas of human concern. Each talk is given either as a single public lecture or as part of a program of panel discussions and lectures sponsored by a University group for public presentation. Included in the yearly schedule of such events are the Alumni War Memorial Lectures; Distinguished Visitors' Program; the University of Massachusetts Assembly lectures and seminars; public lectures of the University's Distinguished Professors of Public Affairs; panel discussions and talks delivered during International Weekend; and the Phi Kappa Phi and Sigma Xi lectures. In addition, individual departments sponsor continuing programs of extra-curricular lectures, seminars and colloquia for the benefit of majors in those departments as well as for other interested persons.

Recognizing that a comprehensive education is not sustained through curricular experience alone, the University urges all of its students to attend as many of the extra-curricular lectures as they possibly can. Students undertaking honors work or participating in Honors Colloquia programs are informed of forthcoming lectures through an Honors Council newsletter. The student body at large is kept informed of such events through notices in the college newspaper as well as through posters, class announcements, and other means. The entire program is directed towards giving students fresh perspectives and a broader experience than that afforded by the University curriculum alone.

HEALTH SERVICE

The Health Service is devoted to the promotion of optimum health among members of the University community. Its concern is for the total health of individuals and groups, as reflected in the need for complete physical, mental, and social well-being.

An expansion of the work of the Health Service has been made possible with the opening of the new Infirmary. The building contains an out-patient department with offices and examining facilities for care of ambulatory patients. In addition, there are 88 beds available for care of students whose needs are best met by hospitalization. X-ray, laboratory, and physiotherapy facilities are available to help in reducing time lost by students for reasons of health.

Recognition of the specific emotional needs of students in an educational environment has led to the provision of an active mental health program including diagnostic and limited treatment services. Orthopedic and radiological consultants are available regularly; other consultation services can be arranged as the need arises. Hospitalization for conditions requiring more specialized care than is available in the Infirmary can be arranged at the Cooley-Dickinson Hospital in Northampton.

Any care rendered on the campus by members of the staff of the Health Service is provided without additional charge to those who have paid the student health fee. The provision of care off campus can be arranged by the Health Services but the cost of this care is a responsibility of the student. A supplementary insurance program, currently underwritten by Massachusetts Blue Cross — Blue Shield, has been developed to provide for most medical and surgical care not available at the Infirmary. All candidates for and members of intercollegiate athletic teams are required to subscribe to the supplementary insurance plan offered by the University.

The Health Service works closely with the School of Physical Education in adapting the facilities of the School to the individual needs of students for restricted or remedial activity. The health status of participants in the athletic program, both intramural and intercollegiate, is under Health Service supervision; and care is always available for any injuries resulting from these activities.

The Health Service also has an active concern for matters of sanitation and safety which affect the health of students, faculty, employees, and visitors. A physician is always on duty at the Infirmary, or on call, to attend emergency needs among families, visitors, and members of conference groups, as well as regular members of the University community.

Students are urged to consult a member of the Health Service staff as soon as any indication of a physical or emotional disorder is evident. It is much easier for the staff, and less time-consuming for the student, to rectify minor difficulties before they have become sources of disability.

Students who are under medical supervision prior to entrance are urged to have their physicians write the Health Service, giving reports and instructions in appropriate detail. Every effort is made to continue treatment without interruption. In brief, the Health Service attempts to provide all students with a coordinated and comprehensive program of health supervision formerly provided by their family physicians.

STUDENT PERSONNEL SERVICES

Under Dean William F. Field, the Office of the Dean of Students is responsible for coordinating the wide variety of personnel services available to students. The office of the Dean of Students, as well as those of the Deans of Men and Women, Placement and Financial Aid Services, and Counseling and Guidance are located in the east wing of Machmer Hall. The Coordinator of Student Activities and the Student Activities Office are located on the second floor of the Student Union. The University Health Service is located in the Infirmary building. The Housing Office is located in Draper Hall. The Admissions and Records Office is located in South College.

The Deans' offices are always ready to counsel or assist with matters concerning students. The Dean of Women's staff advises and serves as

liaison on administrative matters for the Committee on Women's Affairs, House Counselors, Interdorm Council, Panhellenic Council, and all sororities, Mortar Board, Scrolls and other activities of particular interest to women. The Office of the Dean of Men has primary responsibilities for all phases of out-of-class matters with which male students are concerned, such as residence halls, fraternities, the Men's Affairs Committee, conduct, and a host of individual and personal matters.

COUNSELING AND GUIDANCE SERVICES

The Counseling and Guidance Office assists students with personal, emotional, social and vocational choice problems. Students are sometimes referred to this Office by faculty advisers, Student Personnel staff, or dormitory counselors. Many students make appointments directly. Guidance problems such as those associated with choice of major or change of major are ordinarily discussed with faculty advisers. When additional assistance is required, students are often referred, or come of their own choosing, to the Counseling and Guidance Office. Help with reading and study skills is also available in this Office. Special courses in *reading and study skills* development are offered in the School of Education each semester. Arrangements to take such a course should be made through the Counseling and Guidance Office.

ADVISORY SYSTEM

Each student is assigned to a faculty adviser in the department or school in which he has chosen to major. A student will ordinarily see his adviser when he has questions about selection of courses, school or departmental requirements, change of major, or other problems that are primarily of an academic nature. He routinely sees his adviser for mid-semester marks and to pre-register for the next semester. A change of major ordinarily entails a change of adviser. The University also forwards reports of academic standing to the parents. Both students and parents are encouraged to consult with the adviser whenever there are problems regarding studies or personal adjustments to college life. Faculty advisers sometimes refer students to the Deans of their schools or the Counseling and Guidance Office when special problems arise. Students may also make appointments directly.

FRESHMAN COUNSELING PROGRAM

Members of the incoming freshman class are required to attend a summer orientation program of two and a half days. This is a period of testing, counseling and pre-registration. A series of guidance and placement tests will be given and then scored. The student will be assigned to a faculty counselor who will help him select his courses for the fall semester and plan his schedule of hours.

If a student is given advanced placement by a placement examination or by some other means, and if he completes the advanced work (the next course if the courses are in sequence) with a grade of C or better, he will be given credit toward graduation but no grade for the omitted work; if the grade in the advanced work is D, he will be considered to have completed any requirement represented by the omitted work but will not receive credit for the omitted work. Credit with no grade awarded in this manner will be treated as transfer credit in the computation of quality-point averages.

A special program for parents is arranged for the final day of the session at which time they learn about the tests and the results, the student's proposed courses and schedule for fall semester, and the facilities and opportunities at the University.

PLACEMENT AND FINANCIAL AID SERVICES

The primary functions of the Placement and Financial Aid Services lie in vocational and financial counseling and the administration of the techniques involved in aiding students to seek appropriate positions and careers; the granting of loans and scholarships; the assignment of part-time work; the coordination of veterans' affairs; and the dissemination of information relative to military service through the draft or reserves.

Senior Placement

While providing vocational and career counseling for all undergraduates, special emphasis is given to seniors who are provided with job-hunting techniques and other media for determining their future plans following graduation. Actual contact with employers is made during the year when employers from business, industry, schools, and other sources visit the campus to interview prospective graduates.

Cumulative student personnel records, occupational information and industrial literature libraries, prepared credentials, including personal resumes and recommendations, along with counseling and guidance are furnished to enable senior men and women to accomplish their career objectives consistent with their interests, abilities, aptitudes and education.

Financial Aid

See "Financial Information," Page 24.

Military Service Information

The Office of Placement and Financial Aid Services also provides information concerning draft status and military reserve duty. Students who reach draft age (18) may register through this office, which notifies the local draft board. Information is transmitted to local draft boards continuously concerning the status of individual students. Attempt is also made to keep abreast of military reserve affairs to aid students who have questions in this regard.

STUDENT IDENTIFICATION CARD

All undergraduate students at the University of Massachusetts are required to obtain an official University of Massachusetts Identification Card and to carry it on their persons at all times. A fee of one dollar per year, which appears on the fall bill, is charged for the card. I.D. cards are used for the purpose of identification in the Library, for cashing checks, etc. As undergraduate students pay an activities fee for attendance at athletic events, concerts, etc., the I.D. card serves in lieu of a ticket for these functions.

RELIGIOUS ACTIVITIES

The University is concerned in an age of anxiety with the needs for spiritual undergirdings for the educated man. In this day of uncertainty, such concern for the affairs of the spirit has an equal prominence with searching for scientific truths and knowledge in human relations.

The University gives support to the religious life of its students in various ways. It affords the use of University facilities for student groups of all faiths. It cooperates with the official agencies of the three faiths most largely represented at the University by recognizing the contributions of their privately supported chaplains and by giving them facilities and privileges for their work.

On the campus, the religious life of Catholic students is enriched by the program of the Newman Club, of which Rev. David J. Power is chaplain and Rev. J. Joseph Quigley is assistant chaplain. Jewish students participate in services and activities sponsored by the B'nai B'rith Hillel Foundation, of which Rabbi Louis Ruchames is the director. Protestant students join in worship, study, and service planned by the Christian Association, with the guidance of the Protestant chaplains.

Other religious groups such as the Inter-Varsity Christian Fellowship, the Orthodox Club, the Christian Science Organization, and the Lutheran Club also meet regularly on campus and students interested in their programs are welcome to attend. The Campus Religious Council provides a cooperative inter-relationship among the campus religious groups and serves the whole University community by sponsoring the Annual Blood Drive, book and clothing drives, and the Religious Handbook for Freshmen.

The local Protestant and Catholic churches of Amherst provide opportunities for Sunday worship, and Sabbath services for Jewish students on Friday evenings are held at the Student Union. Students are encouraged to attend the services of their respective faiths. Several denominations sponsor active student programs centered in the local churches as well, and students are welcome to attend events and join groups sponsored by the denominations.

Student Activities and Organizations

Participation in extra-curricular activities offers opportunities to further the broader objectives of a college experience. The knowledge, skills and judgment developed in the classroom can be tested and refined through use in the organizational setting. Thus, more than fifty professional clubs exist on campus as a means of stimulating vocational interest through close contact with members of the teaching staff and representatives of the professions. Student government offers a forum for debate on matters of importance to the entire University community. For those interested in communications, there are several campus publications as well as an FM radio station. Experience in music and drama is available in a number of forms.

Such activities can be a profitable means of fostering maturity and general enrichment in those students who wish to take optimum advantage of all that the University can offer. In encouraging participation in these activities, the University asks only that students plan their time well, in order that they may profit as much as possible from a total University program devoted, first and foremost, to academic studies.

The Student Activities Office is the headquarters for Recognized Student Organizations (R.S.O.) and the University Program Office. It provides a banking, bookkeeping and auditing service for student organizations, as well as help and counsel on planning, budgeting, purchasing, contracting, and most other aspects of the affairs of student organizations. An adviser is available to work closely with officers and faculty advisers of student organizations to help them attain their goals and best serve the University.

The University Program Office provides a resource office available to any campus individual or organization with problems relating to programming.

All extra-curricular activities are supervised by the Committee on Recognized Student Organizations composed of faculty and students. Recognition for outstanding achievement in this area is given at an annual Student Leaders Night held in the spring. An office devoted to administering and assisting in the conduct of student activities is located in the Student Union. Detailed information about student organizations may be obtained by contacting the Student Activities Office.

STUDENT GOVERNMENT

The Student Senate, operating under a student approved Constitution, has vested in it all legislative functions of student government and has the primary goal of promoting the welfare of the entire student body. The Senate levies student taxes and appropriates money for many

student activities and services. At the same time, the Senate acts as the official representative of the students both on and off the campus. In coordination with the Dean of Men and the Dean of Women, the Senate has the responsibility of establishing effective rules guiding the activities of students at the University.

STUDENT ORGANIZATIONS

Academic Honor Societies

See Appendix Page 234.

Campus Publications

The Collegian. Tri-weekly newspaper published by undergraduates.

Index. The University yearbook.

Caesura. Magazine for the publication of literary and artistic efforts of undergraduates.

Ya Hoo. Campus humor magazine, published three times a year.

Engineering Journal. Quarterly open to science and engineering students for the publication of technical articles and essays of general interest.

University Music Organizations

Campus music organizations provide experience in musical and allied activities for performers and technicians with various kinds of interest and ability. Membership is open to all students, faculty, alumni, and others in the area community.

Bands. The University Bands program offers opportunity to virtually all interested students to participate in one of the member units. The *Concert Band* is a symphonic group of qualified wind instrumentalists. The *Redmen Band* performs during the football season at all home and some away games. The *Varsity Pep Band* plays for basketball games. The *Dance Band* performs at campus dances and concerts.

Chorale. The University's choral group rehearses notable works for presentation on campus and on tour. Smaller choral ensembles are trained for special musical events.

Operetta Guild. The Guild produces standard works from the repertoire of American musical theater. Membership is open to persons interested in an art form which provides experience in many elements of musical performance as well as in staging, acting, and other theater activities. The Guild sponsors an Opera Workshop each year as well as miniature musical theater groups.

Concert Association. The Association offers students an opportunity to stage professional concerts and recitals and to administer a large-scale annual enterprise involving major financial and promotional concern. The Association each year presents distinguished attractions including national symphony orchestras, outstanding operatic performers, instrumental virtuosi, and other offerings.

The University Theatre

The University Theatre is sponsored by the Department of Speech. Dedicated to the ideal that it has an academic responsibility to every student of the University of Massachusetts as well as those studying theatre, the University Theatre schedules four great plays a year, a program designed to give every student the opportunity of seeing living examples of the dramatic heritage of Western Civilization, in all forms and styles. The University Theatre productions serve as the laboratory for all students majoring in theatre; however, all phases of work on these productions are open to all students regardless of school or major. Roister-Doisters, the student extra-curricular dramatic society (incidentally, the oldest extra-curricular student society on the campus) works in conjunction with the University Theatre and students may earn points toward admission into Roister-Doisters by working on the University Theatre productions. National Collegiate Players, The National Honorary Dramatic Society, is sponsored by the Department of Speech and membership to this society is achieved through recognition of meritorious work done in the University Theatre.

Professional and Special Interest Clubs

Numerous professional clubs, established in connection with the various major courses of study, stimulate students' professional interest in their chosen fields and afford opportunity for discussion of technical subjects of mutual interest.

Among the special-interest groups are the Debating, Flying, Parachute, Equestrian, Ski, Water Ski, and Outing clubs.

Student Honor and Service Societies

Adelphia. The men's senior honor society brings together the most representative men in college who are leaders in various branches of student activity. In recognizing men who have attained a high standard of leadership in college activities, the society strives to preserve valuable traditions and customs and to advance the University of Massachusetts in all ways. Membership is limited to a total of 20 men from the senior and junior classes.

Mortar Board. The Isogon Chapter of Mortar Board was installed at the University of Massachusetts in 1955. The purpose of the Society

is to promote college loyalty, to advance the spirit of service and fellowship among University women, to maintain a high standard of scholarship, to recognize and encourage leadership, and to stimulate and develop a fine type of college woman. Membership is composed of a total of not less than five or more than 25 girls from the senior class selected on the basis of service, scholarship, and leadership.

Maroon Key. The men's sophomore honorary-service society, composed of 25 students recognized for leadership abilities and University services.

Scrolls. Women's sophomore honorary-service society, composed of 20 students elected at the end of the freshman year.

Revelers. A group of upperclassmen chosen to promote and encourage freshman interest and participation in campus activities.

Alpha Phi Omega. A fraternity which renders various kinds of service to the University. The group is composed of former members of the Boy Scouts of America.

Gamma Sigma Sigma. A national service sorority based on the ideals of service, friendship and equality — open to all University women.

Fraternities and Sororities

Social fraternities on the campus include Alpha Epsilon Pi, Beta Kappa Phi, Alpha Sigma Phi, Kappa Sigma, Lambda Chi Alpha, Phi Mu Delta, Phi Sigma Delta, Phi Sigma Kappa, Q.T.V., Sigma Alpha Epsilon, Sigma Phi Epsilon, Tau Epsilon Phi, Tau Kappa Epsilon, Theta Chi, Zeta Nu. An Inter-Fraternity Council, consisting of representatives of these fraternities, has charge of rushing and all general matters dealing with fraternity life. A cooperative organization — The Fraternity Managers' Association — pools the financial resources of all sixteen fraternities for purposes of effecting orderly, economical purchasing and accounting procedures. A professional Fraternity Manager administers the Association's program.

Sororities include Alpha Chi Omega, Chi Omega, Iota Gamma Upsilon, Kappa Alpha Theta, Kappa Kappa Gamma, Lambda Delta Phi, Pi Beta Phi, Sigma Delta Tau, Sigma Kappa, and Sigma Sigma Sigma. The Panhellenic Council, made up of representatives from the sororities, supervises rushing and other sorority matters.

Intercollegiate and Intramural Athletics

The University believes there are educational advantages in a well-organized intercollegiate and intramural sports program. In intercollegiate athletics, the University is represented by teams in all the

leading sports, including football, soccer, cross-country, basketball, swimming, wrestling, indoor and outdoor track, hockey, rifle and pistol, baseball, tennis, golf, lacrosse, gymnastics, skiing.

The University also supports a broad program of intramural activities, in which all students are encouraged to participate. The range of sports available each year includes the team sports of touch football, basketball, softball, volleyball. Individual activities include tennis, bowling, badminton and golf.

The University Intercollegiate Athletic Program is supervised by the University Athletic Council and is composed of the following members: five faculty members appointed by the President, three alumni representatives appointed by the Directors of the Alumni Association, the Executive Director of the Alumni Association, and ex officio, the Director of Athletics.

The University of Massachusetts is a member of the Yankee Conference, the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association of New England Colleges for Conference on Athletics, and the Intercollegiate Athletic Association.

DIRECTORY OF COURSES

COLLEGE OF ARTS AND SCIENCES

I. MOYER HUNSBERGER, *Dean*

Robert W. Wagner, *Associate Dean*

A university is a community dedicated to helping man acquire and extend knowledge and put it responsibly and maturely to use. It provides its members with range and depth of experience, insists upon their thinking critically, fosters their creative abilities, and increases their power to convey ideas. The university also relates areas of specialized knowledge by the development of general and comprehensive ideas.

With respect to knowledge which is at present accepted and applied, a university offers instruction and serves as a custodian. Truth which is only vaguely defined or wholly unknown it regards as a challenge to research, particularly by advanced students and the faculty.

To produce liberally educated people is the specific task of a college of arts and sciences. It encourages its members (1) to seek mastery over language (their own and one or more foreign tongues); (2) to gain insight into the cultures which these languages express; (3) to experience the values of formal thought; (4) to acquaint themselves with the disciplines which deal with animate and inanimate nature; (5) to be aware of the methods and results of the sciences which investigate man, his institutions, and his culture; (6) to comprehend the relation of man's ideals and aspirations to his experience as interpreted by the humanities. The college encourages its members (7) to learn the importance of justifying their beliefs and actions, examining the consequences thereof, and liberating themselves from the bondage of uncritical opinion. Finally, it wishes them (8) to apply and extend knowledge. For these latter purposes, especially, the college must see that its members devote intensive study to particular areas of knowledge. All instrumentalities of the College — facilities, curriculum, influence over student life, choice and support of the faculty — are directed to these ends.

The College of Arts and Sciences offers instruction in the fine arts, the humanities, the social sciences, the natural sciences, and mathematics both for students enrolled in the College and for those in other undergraduate divisions of the University. The program provides for the breadth of intellectual development essential to a liberal education and for concentration which is the necessary foundation for competence in a selected discipline.

The College offers twenty-six undergraduate major programs listed on page 9. They are described on the following pages along with the departmental course offerings except for the pre-medical, pre-dental, and pre-veterinary programs which are described on page 62. There is no formal pre-legal program, but most students who plan to attend a law school prepare themselves by majoring in government or history.

The Bachelor of Arts degree may be earned by students majoring in any division of the College. The Bachelor of Science degree may be earned by students in the natural sciences, mathematics, or psychology. The requirements for these degrees are very similar and are listed below:

Requirements

1. The successful completion of at least 120 credits, exclusive of required physical activity.

2. Speech 3.

3. English 1 and 2 (or 3), 25 (or 28), and 26 (or 29).

4. Intermediate proficiency in a foreign language, as determined by the successful completion of the second year course at the college level or by examination. The latter may be taken during the summer orientation period prior to the freshman year, or during subsequent language study subject to the approval of the department concerned.

5. a) History 5 and 6 must be completed by candidates for the Bachelor of Arts degree.

   b) Candidates for the Bachelor of Science degree must complete at least sixty (60) credits in science, mathematics, and psychology.

6. Two courses of at least three (3) credits each chosen from the courses in the Departments of Art, English, Foreign Languages, History, Music, Philosophy, and Speech which a) are not deemed to be highly specialized or to have a strong pre-professional emphasis and b) are not courses which could be used to complete requirements 2, 3, 4, and 5, except that History 5 and 6 may be used by a candidate for the Bachelor of Science degree. A list of the excluded courses will be available to the student at preregistration and at registration time. At least one of these courses must be from the University's C group.

7. Introductory courses in two social sciences (Economics, Government, Psychology, and Sociology) and two non-introductory courses in one or more of these departments. Of the latter, at least one must be from the University's D group.

8. Three years' work in natural science and mathematics which is made up of a) a year's work (at least 6 credits) in one of the physical sciences —Astronomy, Chemistry, Geology, and Physics — and b) a year's work (at least 6 credits) in biological science made up of courses chosen from the offerings of one or more of the Departments of Botany, Microbiology, and Zoology or Entomology 26, and c) a third year (at least 6 credits) which may be either (i) a year of mathematics, or (ii) a semester of mathematics and a semester of logic, or (iii) two science courses (biological, physical, or both).

9. Completion of one of the major programs in the College. Each of these programs except the pre-medical and pre-dental includes at least 24 credits of upper division courses in the department of the major. A student may not use more than 30 credits of upper division courses in his major department in the minimum graduation total of 120 credits unless the excess is represented by credits in a senior honors project, by requirements waived by examination without credit, or by advanced placement credits.

10. Requirements 1, 2, 3, 4, 5, 6, 7, and 8 may be partially or completely fulfilled by advanced placement or transfer credits or by advanced placement without credit.

There is no special time sequence for fulfilling the graduation requirements, but there are advantages to completing some of them early in the college program. Sample programs for the first two years for each degree are presented below:

B. A.	B. S.
Freshman Year	
English 1 and 2	English 1 and 2
Speech 3	Speech 3
Foreign Language	Foreign Language
History 5 and 6	Mathematics
Mathematics or Natural Science	Physical Science
Social Science	Biological Science

Sophomore Year

English 25 and 26	English 25 and 26
Foreign Language	Foreign Language
Natural Science	Mathematics or Natural Science
Social Science	Social Science
Elective	Elective

The elective in the sophomore year will usually be intimately connected with the student's intended major.

Special Program for Superior Students.

Any student who at the end of the first semester of his junior year presents a quality point average of 3.0 or higher, and is recommended by his major department for release from formal requirements, may, with the approval of his adviser and the Dean, work out a special program of study for his senior year. This program can consist of any approved combination of course work and independent research or creative effort.

Pre-medical, Pre-dental, and Pre-veterinary Programs.

A student whose goal is medicine, dentistry or veterinary medicine must register as a "Pre-med", "Pre-dent" or "Pre-vet" major so that his records will be directed to that member of the Pre-medical Advisory Committee who is assigned as his adviser.

Pre-medical and Pre-dental students will earn the B. A. degree. They must select the following *minimum* science courses: Botany 1; Chemistry 1, 27, 51, 52; Mathematics 9, 10; Physics 3, 4; Zoology 1 and two advanced Zoology courses from 50, 53, 70, 71, 72, 83. French, German or Russian only will satisfy the College language requirement.

The required courses may be arranged in the following manner:

Year I			*Year* II			*Year* III		
Sem. 1		Sem. 2	Sem. 1		Sem. 2	Sem. 1		Sem. 2
1	Engl.	2	25	Engl.	26	-	Physics or Zoology	-
-	For. Lang.	-						
9	Math.	10	-	For. Lang.	-	5	History	6
1(3)	Chem.	2(4)	51	Chem.	52	-	Soc. Sci.	-
1	Bot.		-	Soc. Sci.	-		Chem.	27
			-	Physics or Zoology	-			
	Zool.	1						
	Speech	3				-	Humanity	-
1	Phys. Ed.	2	33	Phys. Ed.	34	-	Elective	

Year IV — Complete concentration requirement plus free electives.

Medical schools do not look with favor on over-specialization in any field. Thus, "Pre-meds" are encouraged to elect more than the minimum required courses in languages and literature, the social sciences, fine arts and other humanities according to their interests.

Since the University requires every student to have a concentration of *at least* 15 credits of advanced undergraduate courses in a single department, the "Pre-med" should plan this concentration in that subject which he enjoys most and which would be his alternate goal if, for any reason, admission to professional school does not materialize. The choice of department in which the concentration is done has no bearing on the student's selection by the medical school. A "science" concentration is in no sense more advantageous than a "non-science" concentration.

Pre-veterinary students may register in either the College of Agriculture or the College of Arts and Sciences, the choice being determined by alternate goals to veterinary medicine. Requirements of schools of veterinary medicine may be met in some instances with 2 years of college training if courses are selected wisely. Under this plan, Zoology 35 and 53 will be substituted for language in Year II above. Students who anticipate more than 2 years in preparation should be guided by the curriculum above.

ART

Head of Department: Professor Paul F. Norton. Associate Professors Matheson, Perkins; Assistant Professor Kamys; Miss Damm, Messrs. Belz, Coughlin, Goodyear, Townsend.

The Department of Art is interested in providing two kinds of training: first, to give each student a good general historical and aesthetic knowledge of the arts; second, to give each student an opportunity to develop his creative ability in the several media of the arts. Majors will have specialized sufficiently to allow them to enroll in a professional art school at an advanced level, or to take jobs upon graduation in business or cultural organizations where some facility in the arts is required. By arrangement with the School of Education, courses can be so arranged that an art major will secure the necessary credits in education to allow him to teach art in the public schools. All majors should take Art 14, and either Basic Drawing or Basic Design during their first two years; and in the junior and senior years a sequence of advanced courses as advised by the department.

14. Introduction to Art

An introduction to great works of art studied in historical sequence; including techniques and aesthetic principles. 3 class hours. Credit, 3.

31. Basic Design

Two-dimensional design concepts arising out of work with specific problems in a variety of media. 6 studio hours. Credit, 3.

32. Basic Design

Continuation of Art 31. Specific three-dimensional problems stressing the interrelationship of materials, processes, techniques and sculptural concepts. Prerequisite, Art 31. 6 studio hours. Credit, 3.

33. Basic Drawing

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation. 6 studio hours. Credit, 3.

34. Advanced Drawing

Continuation of Art 33. Investigation and development of various techniques and media with special emphasis on figure drawing. Prerequisite, Art 33. 6 studio hours. Credit, 3.

51. Water Color

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisites, Art 31, 33. 6 studio hours, Credit, 3.

52. Water Color

Continuation of Art 51. Prerequisite, Art 51. 6 studio hours. Credit, 3.

53. Oil Painting

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 31, 33. 6 studio hours. Credit, 3.

54. Oil Painting

Continuation of Art 53. Prerequisite, Art 53. 6 studio hours. Credit, 3.

57. Printmaking

Basic study of materials, techniques, and aesthetic considerations peculiar to various graphic media. Students print their own work. Prerequisites, Art 31, 33, or permission of instructor. 6 studio hours. Credit, 3.

58. Printmaking

Continuation of Art 57. Prerequisite, Art 57. 6 studio hours. Credit, 3.

60. Sculpture

Experimentation with materials. Investigation into the nature of 3-dimensional form. The development of 3-dimensional order. Individual projects. Prerequisites, Art 32, 33. 6 studio hours. Credit, 3.

61. Sculpture

Continuation of Art 60. Prerequisite, Art 60. 6 studio hours. Credit, 3.

65. Ceramics

Involvement with form through the use of clay and related materials. Hand-building and work on the potter's wheel stress a creative, aesthetic approach. 6 studio hours. Credit, 3.

66. Ceramics

Continuation of Art 65. Prerequisite, Art 65. 6 studio hours. Credit, 3.

71. Ancient Art & Archaeology

The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting. Students are encouraged to take Art 14 before this course. 3 class hours. Credit, 3.

73. Mediaeval Art

Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West. Students are encouraged to take Art 14 before this course. 3 class hours. Credit, 3.

75. Renaissance Art

Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory. 3 class hours. Credit, 3.

76. Baroque Art

The Art of the 17th and early 18th centuries in Italy, Spain, Germany, France and the Low Countries. It is advisable for students to take Art 14 before this course. 3 class hours. Credit, 3.

77. American Art

Study of the earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary phases of abstract art. 3 class hours. Credit, 3.

79. Modern Painting and Sculpture

Origin of modern movements in art, and an analysis of contemporary techniques and styles as they relate to society. 3 class hours. Credit, 3.

81. Modern Architecture

History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. 3 class hours. Credit, 3.

97. 98. Special Problems in Art

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department. Credit, 1-3.

ASTRONOMY

Head: Professor Albert P. Linnell. Associate Professor Yoss; Assistant Professors Koch, Seitter, Sobieski.

The Department of Astronomy is administered jointly with Amherst, Mount Holyoke, and Smith Colleges. The elementary courses are taught separately at each campus, but all advanced courses are given on a joint basis for students from the four participating institutions. Four College courses are identified below by ASTFC.

The Department offers courses which furnish (1) specialization for those planning a career in astronomy, and (2) a background for all students who are interested in astronomy for its cultural or scientific value. Students majoring in astronomy should plan to finish satisfactorily Astronomy 1 and 2, Physics 7, and Mathematics 25 or 30 by the end of the sophomore year. During the junior and senior years the

following courses should be completed: Astronomy 55, 56, 63, and 64; Physics 55, 56; Mathematics 26 or 91, and 92. Students who plan to go to graduate school should also take Physics 61, 63, 85, and 86. These students should also obtain a good reading knowledge of German, French, or Russian.

1. (I) Elementary Astronomy

The solar system, systems of coordinates, laws of motion, planets and satellites, the sun. Supplemented by occasional hours of evening observation. 3 class hours. Credit, 3. Mr. Sobieski.

2. (II) Elementary Astronomy

The astronomical universe. Astronomical instruments. Stellar distances and motions, star clusters and nebulae. Cosmology. Supplemented by occasional hours of evening observation. 3 class hours. Credit, 3. Mr. Sobieski.

55. (I) Astronomical Observation, Reduction, and Analysis (ASTFC 37)

Fundamental astronomical catalogues and their uses; theory of the transit telescope; visual observation with the equatorial telescope and the transit; photography with the equatorial telescope; photographic photometry. Prerequisite, Astronomy 1 and 2. Required of all astronomy majors and registration restricted to these students. 3 class hours. Some classroom hours will be replaced by observing sessions to be arranged. Credit, 3. Staff.

56. (II) Astronomical Observation, Reduction, and Analysis (ASTFC 38)

Astronomical spectroscopy including line identification, plate calibration and radial velocity determination; photography of objective grating spectra; photoelectric photometry including determination of atmospheric extinction and extrapolation to stellar color indices and magnitudes outside the atmosphere; photoelectric light curves of variable stars. Prerequisite, Astronomy 1 and 2. Required of all astronomy majors and registration restricted to these students. 3 class hours. Some classroom hours will be replaced by observing sessions to be arranged. Credit, 3. Staff.

63. (I) Mathematical Astronomy I (ASTFC 43)

Basic topics in astronomy and astrophysics. Astronomical topics in atomic spectroscopy. Physics of radiation and radiative transfer. Basic considerations in the treatment of stellar interiors and atmospheres. Prerequisites, Astronomy 1 and 2; one year of differential and integral calculus; concurrent enrollment in Physics 55. 4 class hours. Credit, 4. Staff.

64. (II) Mathematical Astronomy II (ASTFC 44)

Basic topics in astronomy. The restricted three body problem; advanced concepts in mechanics applicable to astronomical problems; stellar motions and stellar statistics. Prerequisites, Astronomy 63, or permission of the department. 4 class hours. Credit, 4. Staff.

95. (I) 96. (II) Seminar

An individual research project approved by the department. Prerequisite, consent of the department. Credit, 3. Staff.

BOTANY

Head: Seymour Shapiro. Professors Livingston, Schuster; Associate Professors Bigelow, Davis, Gentile; Assistant Professors Putala, Rowley, Wilce; Mrs. Bigelow, Mrs. Skillings.

Programs in botany prepare students for teaching and research in biological sciences in high schools, universities, industry, and experimental stations. Students majoring in botany who do not plan to teach

in secondary schools should complete the following courses prior to their junior year: Botany 1, 25, 26, Chemistry 1, 2, Zoology 1, and Physics 3, 4. Students interested in plant morphology, anatomy or systematics will take the following prescribed courses: Botany 57, 67, 81, and Zoology 53 and a minimum of 3 courses will be required from the following: Botany 59, 60, 61, 62, 66 and 89. Majors planning a preprofessional course in plant physiology and plant ecology will be required to take Botany 57, 67, 81, Chemistry 33 and Zoology 53 with additional courses as determined by the major adviser.

Botany majors planning to teach in secondary schools must complete Botany 1, 25, 26, Zoology 1, and 35, and Chemistry 1 and 2 prior to the junior year. Psychology 56 and Education 51 should be completed in the junior year and Education 52, 85, and 88 must be completed in one semester of the senior year. Required courses in botany will include a selection of at least 5 courses from the following: Botany 57, 61, 62, 66, 67, 81 and 89; some additional courses in related disciplines will be prescribed by the department adviser.

1. (I) and (II) Introductory Botany

Structure, function and reproduction of plants, dealing primarily with the flowering plants. Basic biological principles are emphasized. 2 class hours; 1 quiz hour; 1 2-hour laboratory period. Credit, 3. Staff.

25. (I) The Plant Kingdom

A general survey of the morphology, reproduction, distribution and importance of the slime molds, bacteria, algae, fungi, lichens, liverworts, mosses, ferns and seed plants. Prerequisite, Botany 1. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Davis, Mr. Bigelow.

26. (II) New England Flora

Identification of tracheate plants (lycopods, horsetails, ferns, gymnosperms, angiosperms) and the families they represent. Prerequisite, Botany 1, Botany 25 recommended. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Rowley.

57. (I) Plant Anatomy and Histological Methods

Study of origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies. Prerequisite, Botany 25, or permission of instructor. 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Putala.

59. (I) The Angiosperms

The evolution and systematics of flowering plants, emphasizing families and their relationships. Prerequisite, Botany 25 or 26. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Schuster.

60. (II) Morphogenesis

The development of plant form and structure at the level of cells and organs. Illustrations drawn from controlled experiments on the contribution of internal and external factors. Prerequisite, Botany 25. 2 class hours, 1 3-hour laboratory-discussion period. Credit, 3. Mr. Davis.

61. (II) Phycology

The phylogeny, taxonomy, morphology and ecology of the major groups of the marine and fresh water algae. Field work in marine and fresh water environments. Prerequisite, Botany 25. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wilce.

62. (II) The Archegoniates

The morphology, evolution and systematics of bryophytes, ferns and their allies. Prerequisite, Botany 25. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Schuster.

66. (II) General Mycology

Survey of the various fungi, their life history and distribution, their significance in disease, their utilization by man. Prerequisite, Botany 25, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Bigelow, Mrs. Bigelow.

67. (I) Introductory Plant Physiology

Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration. Prerequisites, Botany 1, Chemistry 1 and 2. Recommended, Chemistry 33 or equivalent. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Gentile.

68. (II) Plant Metabolism

A study of the chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants. Prerequisites, Botany 67, Chemistry 33 or equivalent. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mr. Gentile.

80. (I) Aquatic Vascular Plants

Systematics, ecology and fundamental importance of aquatic plants. A course designed for majors in Wildlife. Prerequisites, Botany 1, 26. 2 3-hour class-laboratory periods. Credit, 3. Mr. Wilce.

81. (I) Plant Ecology

Interrelationships between plants and their environment, with special emphasis on the structure and development of plant communities. Prerequisite, Botany 1; Botany 26 and 67 recommended. 2 3-hour class-laboratory periods Credit, 3. Mr. Livingston.

82. (II) Plant Geography

Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America. Prerequisite, Botany 81. Botany 59 recommended. 3 class hours. Credit, 3. Mr. Livingston.

84. (I) Autecology

Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants. Prerequisites, Botany 67 and 81. 2 3-hour laboratory-discussion periods. Credit, 3. Mr. Livingston.

89. (I) Developmental Plant Cytology

Emphasis on development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures. Prerequisite, Botany 25, or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credits, 3. Mr. Rowley.

97. (I) 98. (II) Special Problems

Supervised problem work for qualified students. Hours by arrangement. Credit, 1-3. Staff.

CHEMISTRY

Head of Department: Professor William E. McEwen. Professors Cannon, Hunsberger, Little, Roberts, Smith, Stein; Associate Professors Carpino, Gawienowski, Rausch, Richason (Associate Head), Robinson; Assistant Professors Brandts, Chandler, Curran, George, McWhorter, Mortensen, Oberlander, Olver, Rowell, Stengle, Stidham, Williams, Zajicek; Staff Associate Lillya; Mrs. Fessenden, Mrs. Parkinson, Messrs. Bernasconi, Turner, Wynne.

The prime purpose of the Department of Chemistry is to offer sound preparation for graduate study in chemistry. Accordingly, emphasis is placed upon intellectual accomplishment and broad understanding rather than on terminal training for specific chemical tasks. The program designed for this purpose also affords sound preparation for direct entry into chemical industry, chemical institutes, or governmental laboratories. A slightly modified program permits preparation for secondary school teaching.

Effective with the Class of 1967, students planning to major in chemistry should take Chemistry 3, 4; German 1, 2; Mathematics 5, 6 (or 9, 10); Botany 1, and Zoology 1 (Microbiology 1 or Entomology 26 may be substituted for ONE of these) in the freshman year. The sophomore year should include Chemistry 51, 52, 53, 54; Mathematics 31, 32 (or 25, 26); Physics 3, 4 (or 5, 6 to be followed by 7 in the junior year); German 7, and a science section of German 8.

An advanced chemistry program is available to students selected by examination prior to freshman registration. These students take Chemistry 25, 26 in the freshman year, replacing 3, 4, and 32. The junior chemistry major takes Chemistry 32 and 65 during the first semester; and 55, 66, and 67, second semester. Chemistry 68 is to be taken during the first semester of the senior year.

To complete requirements for the B. S. degree with a major in chemistry and to qualify for certification to the American Chemical Society the student must take Chemistry 83 and 86, and two additional courses selected from the listing below. One of these two additional courses must be selected from either the "Physical Group" or the "Organic and Biochemistry Group".

(1) Physical Group: 77, 98, Honors (and certain advanced physics and mathematics courses by approval of the Head of the Department).

(2) Inorganic, Analytical, and Radiochemistry Group: 83, 84, 85, 86, 87, 98, Honors.

(3) Organic and Biochemistry Group: 81, 82, 93, 94, 98, Honors.

Students in secondary education may use the Education Block to substitute for two additional courses.

A student may qualify for the B. S. Degree in chemistry (but not for certification to the American Chemical Society) without completing Chemistry 55, 83, or 86. However, the curriculum must then include four courses selected from the above listing. One of these must be a laboratory course, and two different groups must be represented by the selection. Students in secondary education may use the Education Block to substitute for two of the non-laboratory courses in the above groups.

Students may satisfy requirements for the B. A. degree by completing the following: Chemistry 3, 4 (or 1, 2, 29), 32, 51, 52, 53, 54, 65, 66, 67, and 6 credits in chemistry courses numbered higher than 50, one of which must be a laboratory course. The same supporting courses are required as listed for the B. S. curriculum, except that German is not required. The B. A. degree requirements also include History 5 and 6.

1. (I) 2. (II) General Chemistry

A study of the fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry. 2 class hours; 1 quiz hour; 1 2-hour laboratory period. Credit, 3. Mr. Richason and Staff.

3. (I) 4. (II) General Inorganic Chemistry

A study of the fundamental chemical laws and theories, and including the elements of qualitative analysis. For students planning to major in chemistry and others for whom the course is a departmental requirement. 2 class hours; 2 3-hour laboratory periods. Credit, 4. Mr. Richason and Staff.

25. (I) 26. (II) Principles of Chemistry

For students who qualify by examination. A study of fundamental laws and theories including the theory and practice of qualitative and quantitative methods of analysis. 2 class hours, 6 laboratory hours. Credit, 4. Mr. Richason and Staff.

27. (I) Analytical Chemistry

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Not acceptable for major credits except by special arrangement. Prerequisite, Chemistry 2 or 4. 2 lectures, 2 3-hour laboratory periods. Credit, 4. Analytical Staff.

29. (I) and (II) Qualitative Analysis

The fundamental principles of ionic equilibria and the chemistry of important cations and anions, with particular reference to semimicro qualitative analysis. Prerequisite, Chemistry 2. 2 class hours, 6 laboratory hours. Credit, 4. Mr. Wynne.

32. (I) Quantitative Chemical Analysis

A detailed study of the principles and practices of titrimetric and gravimetric analysis; separation methods; introduction to physical methods. Primarily for chemistry majors and others needing a more detailed treatment than is given in Chemistry 27. Prerequisite, Chemistry 4 or 29. 2 lectures, 2 4-hour laboratory periods. Credit, 4. Analytical Staff.

33. (I) and (II) Organic Chemistry

A short course intended to satisfy the requirements in this field for all students who do not specialize in chemistry. Prerequisites, Chemistry 2. 3 class hours, 1 3-hour laboratory period. Credit, 4. Organic Staff.

51. (I) 52. (II) Organic Chemistry

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 2 or 4. Concurrent enrollment in Chemistry 53, 54 is required. 3 class hours. Credit, 3. Organic Staff.

53. (I) 54. (II) Organic Chemistry Laboratory

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 51, 52. 1 3-hour laboratory period. Credit, 1, Organic Staff.

55. (II) Organic Chemistry Laboratory

Continuation of Chemistry 54. Study of preparations involving special techniques and use of the literature of organic chemistry. Prerequisite, Chemistry 52, 54. Limited to Chemistry majors . 2 3-hour laboratory periods. Credit, 2. Organic Staff.

65. (I) 66. (II) Physical Chemistry

A study of the fundamental theories and laws of physical chemistry. Prerequisites, Mathematics 32 or 26; Physics 4, 6, or 9. Corequisite, Chemistry 32 or 27. 3 class hours. Credit, 3. Physical Staff.

67. (I, II) 68. (I) Physical Chemistry Laboratory

Experience in modern physico-chemical techniques. Prerequisites, Chemistry 32; Mathematics 32 or 26; Physics 4, 6, or 9; or permission of instructor. Concurrent enrollment in Chemistry 65, 66. 1 4-hour laboratory period. Credit, 2. Physical Staff.

77. (I) Advanced Physical Chemistry

Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids. Prerequisites, Chemistry 65 and 66. 3 class hours. Credit, 3. Mr. Stein, Mr. Stidham, Mr. Stengle.

79. (I) Elementary Biochemistry

The more important facts relating to biological materials and processes. Designed primarily for students not eligible for courses 93 or 94. Not open to chemistry majors. Prerequisite, Chemistry 33 or 51. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Robinson.

81. (II) Organic Chemistry

An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 3 class hours. Credit, 3. Organic Staff.

82. (I) Qualitative Organic Chemistry

Identification of unknowns, both single and mixtures of organic compounds, by physical properties, reactions and preparation of derivatives. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Organic Staff.

83. (I) Advanced Analytical Chemistry (Instrumental Analysis)

The theory and technique of colorimetry, spectrography, potentiometry, microscopy, polarography, chromatography and other special analytical methods. Prerequisites, Chemistry 32, 66. 2 class hours. 1 3-hour laboratory period. Credit, 3. Analytical Staff.

84. (II) Radiochemistry

The character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radionuclides. Prerequisite, Chemistry 27 or 32, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Richason.

85. (II) Theory of Analytical Processes

A detailed consideration of analytical topics, as chemical equilibrium, precipitate formation, chelating agents, multistage separation, etc., having general applicability in chemical investigations. Prerequisites, Chemistry 52 and 66. 3 class hours. Credit, 3. (Laboratory optional, 1 extra credit.) Analytical Staff.

86. (I) and (II) Theoretical Inorganic Chemistry

A survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanisms. Prerequisite, Chemistry 65. 3 class hours. Credit, 3. Mr. George, Mr. Smith.

87. (I) Inorganic Chemistry of the Common Elements

A systematic consideration of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices. Prerequisite, Chemistry 86, or permission. 3 class hours (6 laboratory hours optional). Credit, 3 (or 5). Inorganic Staff.

88. (II) History of Chemistry

An historical and biographical survey of chemistry and chemists through a study of the development of new ideas and the establishment of new theories and laws. 2 class hours. Credit, 2. Mr. Robinson.

91. (I) Chemical Literature

Intended to give facility in the location of information of a chemical nature. Prerequisites, Chemistry 52, 66, and a reading knowledge of German, or permission of instructor. 1 class hour. Credit, 1. Mr. Oberlander.

93. (I) 94. (II) General Biochemistry

A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field. Prerequisites, Chemistry 51 and 52 or their equivalent. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Little.

98. (II) Introduction to Research

Admission only by permission of the department. To each student is assigned some special subject or problem in one of the several fields of chemistry. Hours by arrangement. 10 laboratory hours. Credit, 5. Staff.

ECONOMICS

Head of Department: Professor Bruce R. Morris. Professors Gamble, Schoeffler, Howard; Associate Professor Blackman; Assistant Professors Martin and Wickman; Messrs. Chaudhry, Miller, Smith, Wendoloski.

In economics the aims are twofold: (1) to give the student an understanding of economic theory and of the application of economic principles to the organization of society; (2) to provide students with the elementary training necessary for further study and solution of economic and business problems. The department requires that all majors irrespective of the career desired take the following courses: Economics 53, 73, Accounting 25, and Statistics 79 or Mathematics 63. In addition, each student must select an additional 15 credit hours of work from the economics curriculum. No major student is permitted to take more than

36 junior-senior credit hours of economics, agricultural economics and business administration courses. In choosing elective courses students are urged to select courses in the humanities and preferably some from the allied fields of history, Philosophy, government, psychology, and sociology. Those intending to major in economics should elect Economics 26 in the sophomore year. For the majors in economics, there are offered courses which may be combined to serve as preparation toward a number of different careers in business, government, and teaching. Possible fields include: Banking and finance, international trade, labor and personnel relations, market research, public utilities including transportation, social security, statistics.

12. (II) Economic History of the United States

Important aspects of the evolution of our modern economic system; social, technological, and other changes which have affected economic institutions; public policy problems involved. 3 class hours. Credit, 3. Mr. F. Smith.

25. (I) and (II) Elements of Economics

Definitions, principles of production, exchange, the distributing methods of allocation of income and revenue. 3 class hours. Credit, 3. Mr. Gamble and Staff.

26. (II) Problems of the National Economy

A continuation of Course 25. Current problems, including international economic planning in peace and war. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Martin and Staff.

53. (I) Money, Banking and Credit

The development and operation of the monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Gamble.

54. (II) Money, Income and Monetary Policy

The relationship between money, income and monetary policy. An examination of the relationships between individuals, banks, money markets, governments and central banks. Prerequisites, Economics 25 and either Economics 53 or Finance 55. 3 class hours. Credit, 3. Mr. Gamble.

55. (I) Economics of Consumption and Personal Finance

Patterns of consumption, standards of living and the sources and expenditure of individual and family incomes. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Morris.

56. (II) Business Fluctuations and Forecasting

Nature and causes of business fluctuations; methods of forecasting; government policy for stability; utility of available statistical data as guides to private and public policy. Prerequisites, Economics 25, 53 or Finance 55. 3 class hours. Credit, 3. Messrs. Howard and Miller.

70. (II) The Structure of American Industry

Business enterprise, market competition, and economic development in American industries. The social effectiveness of industries analyzed through measures of industrial structure and market performance. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Howard.

73. (I) Modern Economic Theory and Analysis

Micro-economic analysis: types of markets: applications of linear programming, theory of games and other techniques for rational business planning; balancing forces in free-enterprise economy. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Schoeffler.

75. Mathematical Methods in Economics

The applications of various mathematical concepts and techniques in macro-economic and micro-economic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economic phenomena. Prerequisites, Economics 25, 26; Mathematics 1, 2 or 4, or consent of the instructor. 3 class hours. Credit, 3. Mr. Chaudhry.

76. Econometrics

The application of mathematical and statistical methods to economic theory. Special emphasis is placed on the application to both micro- and macro-economic policy issues. Prerequisites: Statistics 79 or Mathematics 64 and Economics 75, or permission of the instructor. Credit, 3. Mr. Chaudhry.

77. (I) Economics of International Trade

Policies, principles, and practices of international trade. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Miller.

78. (II) Public Finance

Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment, economic growth and price stability. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Gamble.

79. (I) Labor Problems

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Morris, Mr. Blackman.

80. (II) Labor Law and Legislation

Economic effects and historical survey of Federal and state laws and an analysis of important court decisions. Prerequisites, Economics 25, 79, or consent of the instructor. 3 class hours. Credit, 3. Mr. Blackman.

81. European Economic Evolution

Evolution of economic organization in agriculture, industry and commerce; the surrounding social and institutional life. Prerequisites, Economics 25, History 5 and 6, or consent of the instructor. 3 class hours. Credit, 3. Mr. Blackman.

82. (II) Economic Development

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. Prerequisites, Economics 25, 26. 3 class hours. Credit, 3. Mr. Morris.

83. (I) Social Control of Business

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation or public enterprises for competition. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Howard.

84. (I) Comparative Economic Systems

The structure, operation, and underlying idealogy of the major contemporary forms of social-economic organization. Emphasis on the Soviet Union and the United States. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Schoeffler.

86. (II) Doctrinal Backgrounds of Contemporary Theory

Foundations of classical theory from physiocracy through Mill; neoclassicism and its chief variants, the Lausanne, Austrian and English schools; dissenters Marx, German historical school, Veblen. Prerequisite, Economics 25. 3 class hours. Credit, 3. Mr. Martin.

88. Financial Aspects of Economics

The application of modern flow-of-funds analysis to the financial behaviour of the various sectors of the economy. Special emphasis is placed on the financial aspects of business units and the business sector. Prerequisites, Economics 25 and Accounting 25, or consent of the instructor. 3 class hours. Credit, 3. Mr. Martin.

95. (I) 96. (II) Seminar

Research in economic theory; problems of labor, commerce, and industry. If desirable, some other economic study may be substituted. Prerequisites, Economics 25 and 26. 1 or 2 2-hour conferences. Credit, 1 to 3.

ENGLISH

*Head: Professor Howard O. Brogan. Professors Copeland,[1,2] Helming, Kaplan,[1,2] Koehler, Langland, Musgrave,[2] O'Donnell, Varley; Associate Professors Campbell, Clark, Golden, Haven, McCarthy, Mitchell,[2] Page, Silver, Weston, A. Williams; Assistant Professors Barron, J. Chametzky, Collins, Duckert, Gozzi, J. Hicks, Hogan, Horrigan, McDonald, Rabel, Ratner,[1,2] Rudin, Tucker; Mrs. Billings, Mrs. Boas, Mrs. Burstein, Mrs. A. Chametzky, Mrs. DuBois, Mrs. Edwards, Mrs. Galvin, Mrs. Grahame, Mrs. Harris, Mrs. P. Hicks, Mrs. K. Knight, Mrs. Michelman, Mrs. Oppenheim, Mrs. Wilder, Mrs. Wright, Miss H. Smith, Messrs. Kenseth, C. Knight, Moser, Porter, C. Smith, Stone, Sweeney, R. Williams, Wolf. Miss Dunn,[*2] Mr. Lesser.[*]*

The student who majors in English will gain a considerable knowledge of Western literature; he will develop his skill in expository and creative writing; and he will increase his capacity to read literary works with perception and to judge them by critical standards. Such a program has maximum value as liberal education, and is especially useful to students whose interests are in writing, editing, criticism, and teaching.

The Department of English offers courses in composition, literature, and language. Students majoring in English must (1) elect a semester of English history; (2) elect 30 hours in departmental electives, of which 15 must conform to the distribution requirements of the department; and (3) maintain a quality-point average of 2.0 or better in all departmental electives from the beginning of the junior year on.

1, 2. English Composition

Training in effective composition; readings. 2 class hours. Credit, 2.

F. (I) (II) English for Foreign Students

Rapid grammar review with special emphasis on typical errors of foreign students; oral recitation in class, written compositions; readings from contemporary British and American literature. Students having to meet the English 1, 2 requirement, who show proficiency in this course may, upon recommendation of the instructor, continue with English 2 on completion of this course. 3 class hours. Credit, 0.

[1]On leave first semester of 1963-64. [2]On leave second semester of 1963-64.

[*]Visiting Lecturers.

3. (I) Special Freshman Composition

Exemption from English 1. 2 class hours. Credit, 2.

25. (I) 26. (I) (II) Masterpieces of Western Literature

A study of selected masterpieces. The course aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues. Prerequisite, English 2 or 3; English 25 or 27 is prerequisite to English 26 and to elective courses in the Department. An elective course may, however, be taken concurrently with English 26; for prospective majors, this elective should be English 61. 3 class hours. Credit, 3.

27. (II) 28. (I) Special Course in Masterpieces of Western Literature

A study of the texts read in English 25-26 with additional outside readings; for freshmen who have taken English 3, or are otherwise specially qualified. English 25 or 27 is prerequisite to English 28 and to elective courses in the Department. An elective course may, however, be taken concurrently with English 28; for prospective majors, this elective should be English 61. 3 class hours. Credit, 3.

50. (I) (II) Technical Writing

For majors in engineering. A course in factual and inductive exposition with special emphasis upon process reports and theses. 2 class hours. Credit, 2.

51. (I) (II) Advanced Expository Writing

The writing of informative prose in the forms expected in the students' major fields: reports, articles, essays. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

52. (II) Advanced Technical Writing

Case studies in engineering and industrial reporting, advertising and promotional literature, scientific journalism, and graphic techniques. Given in alternate years. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

53. (I) (II) Creative Writing

Intensive practice in writing prose fiction, with some attention to other forms, supplemented by discussion of ideas and techniques in contemporary literature. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

54. (I) (II) Creative Writing

A continuation of English 53, allowing choice of emphasis upon short stories, poetry, drama, or novel. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

55. (I) Early American Literature

Significant American writing during the Colonial, Revolutionary, and early Federalist periods. Given in alternate years. 3 class hours. Credit, 3.

56. (II) American Poetry

American poetry from 1800 to the emergence of a modern style early in the twentieth century. 3 class hours. Credit, 3.

57. (I) Major American Writers

Selected major American writers of the nineteenth and twentieth centuries, including Emerson, Hawthorne, Longfellow, Lowell, James, Adams, Fitzgerald, and Hemingway. 3 class hours. Credit, 3.

58. (II) Major American Writers

Selected major American writers of the nineteenth and twentieth centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Crane, Dreiser, Wolfe, and Faulkner. 3 class hours. Credit, 3.

60. (II) History of the English Language

The development of English, including a study of vocabulary and usage levels, grammars, and dictionaries. Special attention to matters crucial to the teaching of English in secondary schools. 3 class hours. Credit, 3.

61. (I) (II) History of English Literature

A study of the major phases of English literary history. Representative writers from Chaucer to Dryden will be examined. English majors are expected to include English 61 among their first Departmental electives; it may be taken concurrently with English 26 or 29. 3 class hours. Credit, 3.

62. (II) History of English Literature

A study of representative English writers from the eighteenth century to the present. A continuation of English 61 but may be elected independently. 3 class hours. Credit, 3.

63. (I) Literary Criticism

An examination and application of theories and techniques of criticism, with special consideration of the twentieth century. 3 class hours. Credit, 3.

66. (II) Chaucer

The major works, especially *Troilus* and selected *Canterbury Tales,* as combinations of medieval art and thought with pre-Renaissance motifs and Chaucer's genius for realism. 3 class hours. Credit, 3.

67. (I) Shakespeare

The dramatic art of Shakespeare as revealed in a study of approximately twenty plays. 3 class hours. Credit, 3.

68. (II) Shakespeare

An intensive study of six plays, directed toward a scholarly appreciation of Shakespeare as a dramatic artist. Prerequisite, English 67. Admission by consent of instructor. 3 class hours. Credit, 3.

69. (I) The Renaissance in England

The non-dramatic literature of Tudor and Jacobean England in terms of emergent forms and literary ideas. Special attention to More, Spenser, Bacon, and Thomas Browne. 3 class hours. Credit, 3.

70. (II) Elizabethan and Jacobean Dramatics

Non-Shakespearian dramatists of the English Renaissance. A study of the major plays of Marlowe, Jonson, Beaumont, Fletcher, Tourneur, Webster, and Ford. 3 class hours. Credit, 3.

72. (II) Greek Classics (in translation)

Homer, lyric poetry, the major dramatists, selected dialogues of Plato, Thucydides, and their relations to the classical tradition in English literature. 3 class hours. Credit, 3.

73. (I) Seventeenth-Century Poetry, 1600-1660

A study of such representative poets as Donne, Jonson, Herrick, Lovelace, Suckling, Herbert, Vaughan, Crashaw, Traherne, and Marvel, with emphasis upon the Metaphysical Tradition. 3 class hours. Credit, 3.

74. (I) Milton

Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance with emphasis on *Paradise Lost.* 3 class hours. Credit, 3.

75. (I) The English Novel from Defoe through Austen

The reading and discussion of significant representative novels, also including works of such authors as Richardson, Fielding, Sterne, and Smollett. 3 class hours. Credit, 3.

77. (I) English Literature of the Eighteenth Century

The literature of the Augustan Age, with special emphasis on the writings of Swift and Pope. 3 class hours. Credit, 3.

78. (II) English Literature of the Eighteenth Century

The literature of the later eighteenth century with special emphasis on the Johnson Circle. A continuation of English 77 but may be elected independently. 3 class hours. Credit, 3.

79. (I) The Romantic Poets

A study of the Romantic Movement as revealed in the poetry of Wordsworth, Coleridge, and the other early Romantics. 3 class hours. Credit, 3.

80. (II) The Romantic Poets

A further study of the Romantic Movement, with particular attention to Byron, Shelley, and Keats. 3 class hours. Credit, 3.

81. (I) English Prose of the Nineteenth Century

A study of the techniques and ideas of the chief prose writers, including Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey, Carlyle, and Ruskin. 3 class hours. Credit, 3.

82. (II) English Prose of the Nineteenth Century

The chief Victorian prose writers, including Macaulay, Newman, Arnold, Mill, Huxley, Pater, and Stevenson. A continuation of English 81 but may be elected independently. 3 class hours. Credit, 3.

84. (II) Victorian Poetry

An exploration of the range and diversity of Victorian poetry, with special attention to Tennyson, Browning, Arnold, and the Pre-Raphaelite Movement. 3 class hours. Credit, 3.

85. (I) Modern European Drama (in translation)

Major modern dramatists beginning with Ibsen and including Chekhov, Pirandello, Strindberg, Giraudoux, Shaw, and others. Emphasis on comparative currents in various European nations. 3 class hours. Credit, 3.

86. (II) The English Novel from Scott through Hardy

The reading and discussion of significant representative novels, also including works of such authors as Dickens, Thackeray, the Brontës, Eliot, and Hardy. 3 class hours. Credit, 3.

87. (I) Modern Novel: 1890-1920

The expanding form of the novel and increasing interest in social causes as exhibited in some twelve novels. 3 class hours. Credit, 3.

88. (II) Modern Novel: 1920-1950

An analytical presentation of some twelve novels. A continuation of English 87 but may be elected independently; no English major may, however, elect both English 87 and 88. 3 class hours. Credit, 3.

89. (I) Modern Poetry

An analysis of twentieth-century poetry developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson to those of the present. 3 class hours. Credit, 3.

90. (II) Modern British and American Drama

A study of representative dramatists since the late nineteenth century, including Shaw, Fry, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art. 3 class hours. Credit, 3.

95. (I) Seminar in English Literature or Comparative Literature in Translation

For English majors, but open to others. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

96. (II) Seminar in American Literature

For majors but open to others. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

GEOLOGY

Head of Department: Professor H. T. U. Smith. Professor Farquhar; Associate Professors Motts, Webb; Assistant Professors Burke, McGill, Nelson, Robinson; Messrs. Hayes, Rice.

For students considering geology as a career, the opportunities are many. Those interested primarily in basic science may look to positions in teaching, in museum work, on state and federal surveys, and in various research organizations. Those concerned mainly with applied science may direct their efforts toward work in mining geology, petroleum geology, engineering geology, and ground-water geology, and industrial mineralogy.

For a major in geology leading to the Bachelor of Science degree, requirements are: one year each of chemistry, physics, and biologic science; Mathematics 9, 10 and one additional mathematics course; 33 credits in geology including courses 1 (or 50), 2, 33, 42, 56, 63, 74, 78, and an approved summer field course; and at least 12 additional hours in mathematics, engineering, geology, or other sciences, elected on consultation with the departmental adviser. German and Russian are recommended for the foreign language.

The Bachelor of Arts degree in geology is admirably suited for those planning to teach general science in secondary schools, and may be useful for those planning to be executives in technical industries. Although the Bachelor of Science degree is intended for those considering a professional career in geology, the Bachelor of Arts degree is also adequate, though less thorough, preparation for graduate work in geology.

For a major leading to the Bachelor of Arts degree, requirements are: one year of each of chemistry and physics; one semester of zoology; Mathematics 9; and 30 credits in geology, including courses 1, 2, 33, 42, 56, 72, and 74. Strongly recommended also is additional work in related sciences and mathematics, together with a summer field course (which may be substituted for course 72).

All students majoring in the department are required to maintain a quality point average of at least 2.0 for advanced courses in geology.

Students planning to teach science in secondary schools, or interested in combining geologic and engineering training, may consult the department head for special provisions relating to their programs.

1. (I) (II) Physical Geology

The nature and origin of the landscape features of the earth, and their underlying rocks and structures; including the work of rivers, waves and currents, wind, and glaciers; and the role of earthquakes, volcanoes, and the processes of mountain-building. 2 class hours, 1 3-hour laboratory period, and field trips. Credit, 3. Staff.

2. (I) (II) Historical Geology

Origin and age of the earth; interpretation of the geologic time scale; development on continents and oceanic basins and their relief features; evolution of life. Prerequisite, Geology 1. 2 class hours, 1 3-hour laboratory period and field trip. Credit, 3.

33. (II) Structural Geology

Principles of deformation of the earth's crust; occurrence and recognition of rock structures; graphic solution of structural problems; field observations. Prerequisite, Geology 1. 1 class hour, 2 2-hour laboratory periods and field trips. Credit, 3. Mr. Farquhar.

42. (I) Mineralogy

Chemical composition, physical properties, crystal form, occurrence, and identification of common minerals. Prerequisites, Chemistry 1 and 2. 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Nelson.

50. (I) Engineering Geology

Not open to geology majors. Materials and surface features of the earth with emphasis on engineering problems; map reading as related to the phenomena of physical geology. 2 class hours, 1 3-hour laboratory period or field trip. Credit, 3. Mr. Farquhar.

56. (II) Lithology

Study of the classes of rocks with reference to manner of origin, modes of occurrence, structural features and chemical and petrographic distinction within each group. Prerequisites, Geology 1, 42. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Nelson.

63. (I) Invertebrate Paleontology

A study of the history, development and identification of invertebrate animal fossils. Field trips by arrangement. Prerequisites, Geology 2; Zoology 1. 1 class hour, 2 2-hour laboratory periods. Credit, 3.

64. (II) Plant Paleontology

A study of the history, development, and identification of plant fossils. Field trips by arrangement. 1 class hour, 2 2-hour laboratory periods. Credit, 3.

72. (I) Geologic Field Mapping

An introduction to the instruments and techniques used in field mapping, and their application to the geologic mapping of selected areas. Prerequisites, Geology 35, 56. 8 field hours. Credit, 3. Mr. Robinson.

74. (II) Sedimentology

A study of the composition, classification, and origin of sedimentary rocks, including discussion of source area, mode of transportation and deposition, and diagenesis. Prerequisites, Geology 1, 2, 42. 2 class hours and laboratory period. Credit, 2. Mr. Motts.

78. (I) Principles of Stratigraphy

The principles of stratigraphic correlation and their application to the problems of the major rock units, primarily of the United States. Prerequisites, Geology 1, 2. Course 33 and 74 recommended. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Webb.

81. (I) Optical Mineralogy

Principles of optics, optical properties of minerals and methods for their measurement, relationship between optical properties and crystallography, and mineral identification by the immersion method. Prerequisites, Geology 42, Physics 3 and 4. Credit, 3. Mr. Nelson.

82. (II) Petrography

Study of minerals and common igneous, sedimentary, and metamorphic rocks in thin section; petrographic calculations and measurements; introduction to petrogenetic theory. Field examination of selected igneous and metamorphic rocks. Prerequisites, Geology 56, 81. Credit, 3. Mr. Robinson.

85. (II) Geophysics

The physics of the earth and the gravitational, magnetic, electrical and seismic methods of geophysical exploration. Laboratory work consists of problems and computations. Prerequisites, Geology 33, 56; Mathematics 9; Physics 3 and 4. Credit, 3. Mr. Rice.

89. (I) Geomorphology

Origin and development of landforms in relation to geological processes, climatic environment, and tectonic history. Application of geomorphic methods to interpretation of Cenozoic geologic history. Prerequisites, Geology 1, 2, 33. 2 class hours, 1 2-hour laboratory period. Credit, 3.

91. (II) Photogeology

A laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos. Prerequisites, Geology 33, 72. 2 2-hour periods. Credit, 3. Mr. Smith.

94. (II) Pleistocene Geology

Geochronology of Pleistocene time as related to climatic changes and their influence on glaciology, landforms, sedimentary deposits, sea level, and the paleontological record. Prerequisite, Geology 2, or permission of the instructor. Course 89 recommended. 2 class hours; field trips by arrangement. Credit, 3. Mr. Motts.

96. (II) Seminar

Review of current literature or discussion of selected topics. Credit, 1.

97. (I) 98. (II) Special Problems

For seniors specializing in geology. Total credit may not exceed 6. Prerequisite, 21 hours of geology, or permission of department. Credit, 1-6. The Department.

GEOGRAPHY

35. (I) (II) Fundamentals of Geography

A systematic introduction to the study of physiography, climate, mineral resources, and man's use of his natural environment. 2 class hours. 1 2-hour laboratory period, and field trips. Credit, 3. Mr. Burke.

50. (II) Geography of North America

A regional approach to the study of the physical geography of the continent and its development by man. 3 class hours. Credit, 3. Mr. Burke.

55. (I) Economic Geography

The distribution, production and utilization of the natural resources and commodities on which man's livelihood depends and the problems which they pose. 3 class hours. Credit, 3. Mr. Burke.

81. (II) World Political Geography

The human and physical environments in which states exist and the problems which these environments pose in their current and likely future behavior. 3 class hours. Credit, 3. Mr. Burke.

GERMAN AND RUSSIAN

Head: Professor Frederick C. Ellert. Professors Heller, Weigand; Associate Professor Dolch; Assistant Professors Brackert, Hauser, Lea, Miss Schiffer, Tikos; Mrs. Gladir, Miss Pope, Davis, Schaefer, Stawiecki, Wittmann.

The Department of German and Russian offers a major program in each of these languages. Courses in German are listed below. Offerings in Russian may be found on page 112.

GERMAN

The elementary and intermediate courses in German are intended to serve as a foundation for a practical knowledge of the language aiming toward wider reading in literature, toward mature oral communication and as an aid to research in the various other disciplines. The German major then examines the full range of German literature and culture and comes to grips with the history of the German language and its development within the framework of the Indo-European languages, and, therefore, in terms also of the close relationship between German and English. To fulfill an undergraduate major in German, a student must complete 30 credits in the department's junior-senior courses. German 59 is required of all major students; also German 79 and 80 (or their equivalent). For students planning to go on to graduate work, German 57, 77 and 78 and also History 66 are strongly recommended. Moreover, students are strongly urged to supplement the courses taken here at the University with at least one summer session at an approved school of German.

1. (I) 2. (II) Elementary German

Conversation, reading, grammar, and composition. 3 class hours. 1 laboratory hour. Credit, 3.

7. (I) 8. (II) Intermediate German

Reading, conversation, composition. Grammar review. Prerequisites, German 1 and 2. 3 class hours, 1 laboratory hour. Credit, 3.

51. (I) Nineteenth Century Prose

The *Novelle* from early realism to naturalism. Emphasis on literary and social forces in Heine, Stifter, Keller, Storm, C. F. Meyer. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

52. (II) Poetry and Drama of the Nineteenth Century

Plays of Kleist, Grillparzer, Büchner, Hebbel, Hauptmann. The poetry of Mörike, Lenau, Droste-Hülshoff. Nietzsche. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

53. (I) Twentieth Century Prose

Main literary currents from Nietzsche to Hesse. Particular attention to the works of Thomas Mann, Kafka, and Werfel. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

54. (II) Poetry and Drama of the Twentieth Century

Poetry of Hofmannsthal, George and Rilke. Plays of Hauptmann, Kaiser, Brecht and others. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

55. (I) Storm and Stress

Eighteenth century Titanism in German literature centering in the early Goethe. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

56. (II) Romanticism

Poetry and prose of the romantic period from Hölderlin to Heine. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

57. (I) Goethe's Faust

Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

59. (I) The Germanic Languages

Introduction to general and Germanic philology. Historical development particularly of German and English and their relationship to other languages of the Indo-European family. 3 class hours. Credit, 3.

60. (II) The Classical Period

Representative works of Lessing, Goethe, and Schiller. Prerequisites, German 7 and 8. 3 class hours. Credit, 3.

67. (I) German Masterpieces in Translation

Literary works ranging from the Middle Ages to the present. Admission by permission of department. 3 class hours. Credit, 3.

70. (II) Scientific German

Expository prose. Prerequisites, German 7, 8, or equivalent. 3 class hours. Credit, 3.

77. (I) Survey of German Literature I

German literature from the Middle Ages to the Age of Enlightenment. Prerequisites, German 7, 8, or equivalent. 3 class hours. Credit, 3.

78. (II) Survey of German Literature II

German literature from 1770 to the present. Prerequisites, German 7, 8, or equivalent. 3 class hours. Credit, 3.

79. (I) 80. (II) German Conversation and Composition

Practice in the oral and written language. Prerequisites, German 7 and 8, or permission of instructor. 4 class hours. Credit, 3.

97. (I) 98. (II) Special Problems

Guided reading and research in areas of specialization. For qualified seniors. Credit, 3.

GOVERNMENT

Head: William C. Havard. Professors Beth, Fenton, Harris, Oppenheim, Vali; Associate Professors Braunthal, Houn, Lewy: Assistant Professors Allen, Mainzer, Syed: Messrs. Mayhew, Steeper; Distinguished Professor in Public Affairs (1964-65): Mr. Richardson Dilworth; Lecturers: Grady, Healy, O'Hare.

Courses in government are designed to aid the student in gaining a knowledge of the nature, functions and problems of political systems, and of the place of politics in the modern world. These courses can be broadly grouped into the fields of political theory, public law, international relations, both American and foreign governments and politics, and public administration.

Students taking work in government may prepare themselves for a wide range of careers, such as: graduate study in political science, leading to academic or research careers; careers in public service at the federal, state or local level; political careers; the study and practice of law; the foreign service or international organizations; and secondary school teaching.

Majors in government begin with Government 25 and 26, preferably in their freshman or sophomore years. A minimum of eight additional courses is required, including one course in political theory and one in public law. In addition, the department requires some supporting work in history, economics, sociology, psychology or philosophy.

25. (I) (II) American Government

Political institutions and processes, as illustrated by the American governmental system. 3 class hours. Credit, 3.

26. (I) (II) European Governments

A survey of the politics and governmental institutions of Great Britain, France, Germany and Soviet Russia. 3 class hours. Credit, 3.

51. (I) Municipal Government

A survey of the governmental structure and function of American municipalities. 3 class hours. Credit, 3. Mr. Grady.

52. (II) American Foreign Policy

An analysis of the principles of American foreign policy. Constitutional, political, and administrative considerations which influence the formulation and execution of American foreign policy. 3 class hours. Credit, 3. Mr. Allen, Mr. Braunthal.

53. (I) (II) International Relations

The nation-state system and conceptions of national interest in modern world politics. Forms and distribution of power. Making of foreign policy and adjusting international conflict. Prerequisite, Government 26 or History 6. 3 class hours. Credit, 3. Mr. Braunthal, Mr. Vali, Mr. Allen.

54. (II) State Government

A study of state politics, organization and functions, with emphasis on the role of the state in our Federal system. 3 class hours. Credit, 3. Mr. Mayhew, Mr. Fenton.

55. (Summer) The Presidency in American Government

Constitutional and political aspects of the presidency in legislation, administration and conduct of foreign and military affairs. The president as party leader. Prerequisite, Government 25. Credit, 3. Mr. Fenton.

56. (II) The Legislative Process

The functions of national and state legislatures, legislative procedures, and the role played by political parties and pressure groups in the legislative process. Prerequisite, Government 25 or 63. 3 class hours. Credit, 3. Mr. Mayhew, Mr. Fenton.

57. (II) The Government and Politics of Russia

Organization and functioning of the Communist party; the administrative process; terror as a system of power; Soviet foreign policy, its formation and execution. 3 class hours. Credit, 3. Mr. Vali.

61. (I) Public Administration

The organization of bureaucracy; the bureaucratic life; the constitutional position and political role of government bureaucracy. 3 class hours. Credit, 3. Mr. Mainzer.

62. (II) Administrative Law

A study of governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate. 3 class hours. Credit, 3. Mr. Mainzer.

63. (I) (II) Political Parties and Elections

A study of the American political process, with emphasis on parties, pressure groups, and public opinion. 3 class hours. Credit, 3. Mr. Fenton, Mr. Mayhew.

64. (II) The Law and Practice of Civil Liberties

Development in American Constitutional Law of the concept of civil liberty, including free speech and religion, fair trial, and race discrimination. Prerequisite, Government 25. 3 class hours. Credit, 3. Mr. Beth.

65. (I) Constitutional Law

An historical study of the United States Constitution as interpreted by decisions of the Supreme Court. Prerequisite, Government 25. 3 class hours. Credit, 3. Mr. Beth.

66. (I) American Political Thought

A study of the development of American political thought from colonial times to the present. 3 class hours. Credit, 3. Mr. Syed.

68. (II) International Law

A study of the origin, character, and function of international law. Prerequisite, Government 53 or History 70. 3 class hours. Credit, 3. Mr. Allen, Mr. Vali.

70. (II) International Organization

A study of international organization in the twentieth century, with emphasis upon the United Nations and regional organizations. Prerequisites, Government 26 or History 6, and Government 53 or History 70. 3 class hours. Credit, 3. Mr. Braunthal, Mr. Vali.

71. (I) Ancient and Medieval Political Thought

A study of the development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages. 3 class hours. Credit, 3. Mr. Lewy, Mr. Oppenheim.

72. (II) Modern Political Thought

A study of the development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present. 3 class hours. Credit, 3. Mr. Lewy, Mr. Oppenheim.

76. (II) Public Opinion in Politics

A study of opinion and communication as aspects of the political process with emphasis upon communication through mass media. 3 class hours. Credit, 3. Mr. Fenton.

78. (II) Municipal Administration

Administrative management in American municipalities based on descriptive literature, case materials, and personal observation, with particular attention to Massachusetts cities and towns. Prerequisite, Government 51. 3 class hours. Credit, 3. Mr. O'Hare.

80. (II) Municipal Law

A study of the legal problems encountered in the creation and operation of local government, with special reference to Massachusetts cities, towns, and counties. 3 class hours. Credit, 3. Mr. O'Hare.

83. (II) Public Personnel Administration

The Personnel function in bureaucracy; patronage and merit; career service and political executives; authority and informal organization; employee rights and collective action. Prerequisite, Government 25 or 61. 3 class hours. Credit, 3. Mr. Mainzer.

84. (I) Governmental Financial Administration

Theory, practice, and organization, including budgeting, revenues, debt operations, records administration, purchasing, audits, and financial reporting. Prerequisites, Government 25, 51 or 61. 3 class hours. Credit, 3. Mr. O'Hare.

85. (I) (II) Major Governments of Asia

Comparative analysis of the government and politics of selected democratic and non-democratic countries in Asia — Japan, India, Pakistan, Indonesia and Communist China. 3 class hours. Credit, 3. Mr. Houn, Mr. Syed.

93. (I) (II) The Practice of American Politics

A course in practical American politics, given by a prominent political leader under the University Distinguished Professorship in Public Affairs. Prerequisite, Government 25. Credit, 3.

95. (I) 96. (II) Seminar

A study of special problems in the field of government. 3 class hours. Credit, 3.

HISTORY DEPARTMENT

Head: Professor Howard H. Quint, Professors Caldwell, Cary, Gordon, Potash; Associate Professors Davis, Greenbaum, Ilardi, Powers, Williams; Assistant Professors Bernhard, Cantor, Cody, De Pillis, Gagnon, Leonard, Thompson, van Steenberg, Wickwire; Instructors Mrs. Chrisman, Mrs. Gordon, Mrs. Poor, Mrs. Wickwire, Miss Guimond, Messrs. Beitzell, Dilkes, Evans, Gebhard, Russo; Visiting Lecturer Ruchames.

Courses in history are designed to provide an understanding of man through a study of patterns of development in the past. The study should also give the student an introduction to major problems in world affairs. A major in history has value to the general student as a humanistic discipline. It has application as preparation for careers in fields of

teaching, law, government, journalism, ministry, library and business.

Majors must take as basic required courses History 5, 6, 25, and 26 in their freshman and sophomore years, History 90 in their junior year, and History 95 or 96 in their senior year. The History major will select one of three areas of specialization (European, American, or Latin American History) and take within it a minimum of 15 or a maximum of 18 hours of upper-level course work. Students specializing in European History will be required to include in their program at least 3 hours of coursework in Ancient or Medieval History and an additional 3 hours of coursework in the Early Modern period (from the Renaissance through the 18th century).

5. (I) 6. (II) Modern European Civilization

The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently. 3 class hours. Credit, 3.

25. (I) 26. (II) The Development of American Civilization

A survey of the American national growth. Either semester may be elected independently. 3 class hours. Credit, 3.

31. (I) 32. (II) English History

Emphasis on economic, social, and cultural influences, as well as on constitutional development. Either semester may be elected independently. 3 class hours. Credit, 3. Mr. Caldwell, Mr. Wickwire.

51. (I) The Ancient World to Alexander the Great

From the neolithic background of civilization to the dissolution of Alexander's Empire. 3 class hours. Credit, 3. Mr. Williams.

52. (II) The Ancient World: The Hellenistic Period to Constantine

From the development of Hellenistic civilization to the stagnation of Graeco-Roman culture. 3 class hours. Credit, 3. Mr. Williams.

53. (I) 54. (II) History of Far Eastern Civilization

The first semester will stress traditional and modern China, the second, Japan and Korea. Either semester may be elected independently. 3 class hours. Credit, 3. Mr. Cody.

55. (I) 56. (II) The History of Russia

A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. Prerequisites, History 5 and 6. 3 class hours. Credit, 3. Mr. Dilkes.

57. (I) Colonial Latin America

A study of Spanish and Portuguese expansion into the New World, the Indian cultures, the development of political, social, and economic institutions, and the growth of the independence movement to 1810. 3 class hours. Credit, 3. Mr. Potash.

58. (II) Brazil and Argentina in the Nineteenth and Twentieth Centuries

The emergence of the major South American states. Particular attention will be paid to the themes of political organization and economic change; and in the contemporary period to the growth of nationalism and mass-based political movements. 3 class hours. Credit, 3. Mr. Potash.

59. (I) The History of Mexico

A study of Mexico from the end of the eighteenth century to the present. Emphasis will be given to political, economic, and social developments. 3 class hours. Credit, 3. Mr. Potash.

60. (II) Social History of the United States

The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. 3 class hours. Credit, 3. Mr. De Pillis.

61. (I) Early Middle Ages (300-1100)

Spread of Christianity; pagan and early Christian culture; Germanic kingship; the Carolingian world; early feudalism; monasticism and ecclesiastical centralization. 3 class hours. Credit, 3. Mr. Williams.

62. (II) The Later Middle Ages (1100-1350)

Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism. 3 class hours. Credit, 3. Mr. Williams.

63. (I) 64. (II) History of American Thought and Culture

The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently. 3 class hours. Credit, 3. Mr. Quint.

65. (I) Tudor-Stuart England, 1485-1688

Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. 3 class hours. Credit, 3. Mr. Caldwell.

66. (II) The History of Modern Germany

The evolution and development of Germany since the accession of Frederick the Great with emphasis upon diplomatic, political, military and social-economic trends and problems. 3 class hours. Credit, 3. Mr. Gordon.

67. (I) United States Constitutional History to the Civil War

Origins and development of American constitutionalism from the 17th century to the outbreak of sectional armed conflict. 3 class hours. Credit, 3. Mr. Cantor.

68. (II) United States Constitutional History from the Civil War to the Present

Evolution of constitutional power in modern America. 3 class hours. Credit, 3. Mr. Cantor.

69. (I) Europe, 1870-1918

Internal developments of the principal countries; a detailed study of conditions and diplomacy which led to the World War; and military and diplomatic history of the war years. Prerequisite, History 6. 3 class hours. Credit, 3. Mr. van Steenberg.

70. (II) Europe since 1918

Major developments in the internal and international affairs of the European states since World War I. 3 class hours. Credit, 3. Mr. Caldwell.

71. (I) The South in American History

From early settlement to contemporary regional problems. 3 class hours. Credit, 3. Mr. Thompson.

72. (II) History of American Westward Expansion, 1763-1893

Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions. Prerequisite, History 25, or permission of instructor. 3 class hours. Credit, 3. Mr. Davis, Mr. De Pillis.

73. (I) 74. (II) The Age of the Renaissance and Reformation, 1300-1600

A study of the changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently. 3 class hours. Credit, 3. Mr. Ilardi.

75. (I) Europe in the Enlightenment, 1685-1789

Civilization of Western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions, and the growth of revolutionary spirit. 3 class hours. Credit, 3. Mr. Greenbaum.

76. (II) History of Europe, 1815-1870

Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-Prussian War. 3 class hours. Credit, 3. Mr. Gagnon.

77. (I) Modern Britain

A study of selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. 3 class hours. Credit, 3. Mr. Caldwell.

78. (II) France Since 1789

A study of selected, formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France. 3 class hours. Credit, 3. Mr. Gagnon.

79. (I) New England to 1860

A study of the colonial and early national periods, with emphasis on the political, social, and economic aspects of life in this region. 3 class hours. Credit, 3. Mr. Cary, Mr. Bernhard.

81. (I) 82. (II) Diplomatic History of the United States

The development of American foreign relations, 1776 to the present. Either semester may be elected independently. Prerequisites, History 25, 26, or permission of the instructor. 3 class hours. Credit, 3. Mr. Cary.

83. (I) The Progressive Age (1900-1920)

A study of the political response to the changing economic and social conditions in American life. 3 class hours. Credit, 3. Mr. Thompson.

84. (II) Conservatism and Reform (1920-1945)

American political, economic and intellectual life between the two World Wars. 3 class hours. Credit, 3. Mr. Thompson.

85. (I) European Intellectual History in the Nineteenth Century

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture. 3 class hours. Credit, 3. Mr. Powers.

86. (II) European Intellectual History in the Twentieth Century

Philosophical, academic, literary, aesthetic, political and popular currents since 1900. 3 class hours. Credit, 3. Mr. Powers.

87. (I) American Colonial History to 1763

Discovery and exploration; early European settlements; systems of political and economic control; religious and intellectual development; and Anglo-French rivalry. 3 class hours. Credit, 3. Mr. Bernhard.

88. (II) The American Revolutionary Era

Coming of the Revolution; War for Independence; evolution of American federalism. 3 class hours. Credit, 3. Mr. Bernhard.

89. (I) Jeffersonian and Jacksonian America

Political, economic and social developments in the National Period. 3 class hours. Credit, 3. Mr. Cantor.

90. (II) Historiography and Bibliography

Training in location, appraisal, and handling of source materials. Critical evaluation of technique and ideas of representative historians from Thucydides to Toynbee. 3 class hours. Credit, 3. Mr. Greenbaum, Mr. Gagnon, Mr. Powers.

91. (I) Civil War and Reconstruction, 1860-1877

Conduct of the war, political problems; national reunification. 3 class hours. Credit, 3. Mr. Cantor.

92. (II) History of the British Empire and Commonwealth since 1783.

Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent empire; role of the Empire in world politics. 3 class hours. Credit, 3. Mr. Wickwire.

93. (I) Military History of Modern Europe

Development of European military theory and practice from the Napoleonic era to the present. 3 class hours. Credit, 3. Mr. Gordon.

94. (II) The French Revolution and Napoleon

Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon. 3 class hours. Credit, 3. Mr. Greenbaum.

95. (I) Seminar in European History

A problems course intended to give training in historical research and writing. The field of study will vary from semester to semester. Prerequisites, History 5 and 6. 3 class hours. Credit, 3. Staff.

96. (II) Seminar in American History

Similar to History 95, but dealing with fields of American and Latin American history. Prerequisites, History 25 and 26. 3 class hours. Credit, 3. Staff.

JOURNALISTIC STUDIES

The journalism program is concerned with (1) the study of writing and of communication problems relevant to the media of mass communication, and (2) the best utilization of the University's liberal education resources by students who plan careers in newspaper work, communications research, public relations, magazine and radio journalism, or some other field of communications. The courses may have special value also for students who plan to go into government service, law, education, and similar fields in which knowledge of the process and effects of communication is particularly useful.

To provide students who have a professional interest in journalism with the broadest and most liberal training, an interdepartmental major is available. These majors take 15 credit hours in journalism, 15 hours of junior-senior courses in one other liberal arts area, and an integrated program of elective courses. As a rule this major is limited to students who have a 2.5 quality point average at the end of their sophomore year.

Because of the similarity in the process of writing regardless of the type of writing produced, any advanced writing course is acceptable in meeting the requirement of 15 credit hours in journalism. No more than one writing course should be elected in any one semester. Two content courses in journalism — Journalism 55 and Journalism 96 — are required of all interdepartmental majors or journalism minors.

JOURNALISTIC STUDIES

Professor Musgrave

51. (I) Advanced Expository Writing. Same as English 51.

52. (II) Advanced Technical Writing. Same as English 52.

53. (I) (II) Creative Writing. Same as English 53.

54. (I) (II) Creative Writing. Same as English 54.

55. (I) Introduction to Mass Communication

Topics include the communications revolution and freedom of the press, the communication process, methods of reporting and writing, communication theory and research. 3 class hours. Credit, 3. Mr. Musgrave.

56. (II) Language and Communication

Analysis of several major approaches to language study. Stress is given to problems of style and meaning. 3 class hours. Credit, 3. Mr. Musgrave.

59. (II) Article Writing

A study of magazine journalism combined with instruction in the writing of feature or magazine articles. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

95. (I) Seminar

Writing for publication and training in copy editing. University student publications and town newspapers are used as laboratories. 2 class hours, 1 laboratory period. Credit, 3. Mr. Musgrave.

96. (II) Freedom of the Press

Seminar in freedom of the press: (1) its history, (2) major theories, (3) key cases in Anglo-American law, and (4) recent trends toward its redefinition. 3 class hours. Credit, 3. Mr. Musgrave.

MATHEMATICS

Acting Head of Department: R. W. Wagner. Professors Andersen, Azpeitia, Jacob, Kundert; Associate Professors Boutelle, Cullen, Dickinson, Evyatar; Assistant Professors Allen, Bloom, Kertzner, Killam, Lavallee, McHaffey, Norvig, Patnaik, Sayied, Stockton; Mr. Bunuel, Mr. Bussel, Mr. Call, Mrs. Cook, Mr. Efroymson, Mr. Jacobs, Mr. L'heureux, Miss Mannarino, Mr. Naylor, Mrs. Ratay, Mrs. Rice, Mr. Sember, Miss Tobin; Mrs. Arons, Mrs. Clough, Mrs. Damon, Mr. Dutton; Graduate Assistants Bennett, Bird, Boyle, Brittain, Bucuzzo, Connors, Foster, Howland, LeCuyer, McDonald, Tattersall.*

The department offers courses designed to furnish a strong foundation for graduate study in mathematics as well as courses to develop the

* *On leave of absence, 1963-64*

understanding and techniques of mathematics needed in fields such as business and social sciences, chemistry and physics, engineering, industrial mathematics, insurance, statistics, and teaching.

The major requirements for the class of 1964 are: 1) completion of Mathematics 30 or its equivalent, and 2) a minimum of eight upper division courses in mathematics, other than Mathematics 55, which must include Mathematics 53, 54, 91, and at least one of the courses Mathematics 61 or 85.

For the class of 1965: 1) completion of Mathematics 30 or its equivalent, and 2) a minimum of eight upper division courses in mathematics, exclusive of Mathematics 55, which must include Mathematics 53, 54, 91 and at least one of the courses Mathematics 61, 81, 85 or 93.

For the class of 1966: 1) completion of Mathematics 26 or its equivalent, and 2) a minimum of eight upper division courses in mathematics, exclusive of Mathematics 55, which must include Mathematics 53 and 54 and at least one of the courses Mathematics 81, 85, or 93.

In all cases, at most two of the courses Mathematics 63 and 64 and Statistics 55 and 56 may be counted in the minimum of eight upper division courses.

01. (I) Elementary College Algebra

Intended for those students who offer only one unit of algebra for entrance. A review of elementary algebra and a more thorough study of such topics as quadratic equations, exponents and radicals, and progressions. No college credit is given for this course. 3 class hours. Credit, 0.

1. (I) (II) Introductory Mathematics I

Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions, algebraically and by the methods of analytic geometry. 3 class hours. Credit, 3.

2. (I) (II) Introductory Mathematics II

A terminal course intended for students whose curriculum calls for just one year of mathematics. A continuation of Mathematics 1, including topics from the calculus, statistics, and mathematics of finance. Prerequisite, Mathematics 1. 3 class hours. Credit, 3.

5. (I) (II) Introductory Engineering Mathematics

Introduction to analytic geometry and calculus. 4 class hours. Credit, 4.

6. (I) (II) Introductory Calculus for Engineering

Continuation of Mathematics 5. Prerequisite, Mathematics 5. 4 class hours. Credit, 4.

7. (I) (II) Algebra and Trigonometry

Fractions, quadratic equations, exponents, logarithms, variation, determinants of the second and third orders, and plane trigonometry. 3 class hours. Credit, 3.

9. Analytic Geometry and Calculus I

Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivatives, differentiation of algebraic functions, tangent and normal lines. 3 class hours. Credit, 3.

10. Analytic Geometry and Calculus II

Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Mathematics 9 and Trigonometry. 3 class hours. Credit, 3.

22. (I) (II) Mathematics for Business Administration and Economics

Logic, sets, vectors, matrices, linear programming, calculus of algebraic functions, extrema of functions of one and two variables with business applications. Not open to Mathematics and Natural Science majors. Prerequisite, Mathematics 2. 3 class hours. Credit, 3.

25. Analytic Geometry and Calculus III

Techniques of integration, further applications of calculus, basic properties of continuous and differentiable functions, parametric equations, polar coordinates, infinite series. Prerequisite, Mathematics 10. 3 class hours. Credit, 3.

26. Analytic Geometry and Calculus IV

Solid analytic geometry, partial differentiation, multiple integrals with applications, introduction to differential equations. Prerequisite, Mathematics 25. 3 class hours. Credit, 3.

31. (I) (II) Applied Calculus for Engineers

Parametric equations, vectors, determinates, partial differentiation, multiple integrals. Prerequisite, Mathematics 6. 4 class hours. Credit, 4.

32. (I) (II) Applied Calculus for Engineers

Infinite series, expansion of functions, hyperbolic functions, differential equations. Prerequisite, Mathematics 31. 4 class hours. Credit, 4.

52. (I) (II) Introduction to Vector Spaces

The last two-thirds of Mathematics 54. Finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants. Prerequisite, Mathematics 10, or permission of the department head. 3 class hours for the last two-thirds of a semester. Credit, 2.

53. (I) (II) Introduction to Modern Algebra

Basic concepts, groups, rings, the real and complex fields. Prerequisites, Mathematics 26, or 31. 3 class hours. Credit, 3.

54. (I) (II) Continuation of Mathematics 53

Polynomials, cyclic groups, finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants. Prerequisite, Mathematics 53. 3 class hours. Credit, 3.

55. (I) Mathematics of Finance

The mathematical principles of simple and compound interest, annuities, depreciation, valuation of bonds, and insurance. May not be counted for Mathematics major credit. Prerequisites, Mathematics 1, 5, 7 or 9. 3 class hours. Credit, 3.

57. (I) (II) Linear Programming and Theory of Games

The Simplex Method and extensions, duality theorems, transportation problems and other applications. Finite two-person zero-sum games and the fundamental theorem. Prerequisite, junior-senior standing in Mathematics or permission of the instructor. 3 class hours. Credit, 3.

58. (II) Introduction to Digital Computers

The basic digital computing system, introduction to Boolean Algebra, logical design of computers, programming, coding, utility programs, criteria for evaluation of computers. Prerequisite, Mathematics 26, or permission of instructor. 3 class hours. Credit, 3.

61. Projective Geometry

A study, from both the synthetic and analytic viewpoints, of properties invariant under projection, with emphasis on the real plane. Equivalence of Desarguesian and coordinate projective geometries. Prerequisite, Mathematics 53. 3 class hours. Credit, 3.

62. Higher Geometry

A study along the lines of Klein's *Erlanger Programm* of various geometries and their groups of transformations, emphasizing Projective, Affine, and Euclidean. Prerequisites, Mathematics 54 and 61, or permission of instructor. 3 class hours. Credit, 3.

63. Probability

A postulational study of probability, including counting methods, random variables; additional topics chosen from Bayes theorem, statistical independence, laws of large numbers and Markov processes. Corequisite, Mathematics 26. 3 class hours. Credit, 3.

68. (I) Linear Algebra

Row equivalence, Linear transformations and matrices. Similarity Invariant subspaces, canonical forms. Inner product spaces, linear functionals, the spectral theorem. Bilinear forms. Prerequisite, Mathematics 54 or 52. 3 class hours. Credit, 3.

69. (II) Theory of Groups and Group Representations

Axiom systems, Lagrange theorem, generators, relations. Conjugate classes, normal subgroups, quotient groups. Sylow theorems. Abelian groups. Unitary and irreducible representations. Characters, orthogonality relations. Prerequisite, Mathematics 68. 3 class hours. Credit, 3.

71. (I) Vector Analysis

The Algebra and Calculus of vectors. Applications to Physics and other fields will be considered. Prerequisite, Physics 4 or 6; corequisites, Mathematics 26, 31 or 91. 3 class hours. Credit, 3.

74. (II) Theory of Numbers

Euclid's Algorism, theory of prime numbers, aliquot parts, congruences, further topics in number theory. Prerequisite, Mathematics 53. 3 class hours. Credit, 3.

75. (I) Survey of Advanced Mathematics for Engineers

Series solution of differential equations boundary value problems, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in Mathematics. Prerequisite, Mathematics 92 or 32. 3 class hours. Credit, 3.

76. (II) Survey of Advanced Mathematics for Engineers

Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in Mathematics. Prerequisite, Mathematics 92 or 32. 3 class hours. Credit, 3.

81. (I) Complex Analysis

The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration, Taylors series, and residues. Prerequisite, Mathematics 92 or 32. 3 class hours. Credit, 3.

83. (I) Numerical Analysis

Approximation and error evaluation; finite differences; approximation by polynominals using finite difference methods and minimal criteria; special reference to sets of orthogonal polynominals. Prerequisites, Mathematics 26, 32 or 91; and Computer Science 21 previously or concurrently. 3 class hours. Credit, 3.

84. (II) Numerical Analysis

Evaluation of definite integrals; solution of differential equations, polynominal equations, other conditional equations, and systems of linear equations with related matrix manipulations. Prerequisites, Mathematics 32 or 92, and 83. 3 class hours. Credit, 3.

85. Introductory Modern Analysis I

Real and complex numbers. Basic Topology of the real number system. Limit concept and continuity. Differentiation. Partial differentiation. Prerequisite, Mathematics 26 or 91. 3 class hours. Credit, 3.

86. Introductory Modern Analysis II

Bounded variation. Riemann-Stieltjes integration. Multiple integrals. Line integrals. Infinite series. Sequences of functions. Improper Riemann-Stieltjes integrals. Prerequisite, Mathematics 85. 3 class hours. Credit, 3.

88. Sets and Ordered Structures

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic. Prerequisite, Mathematics 85, or permission of instructor. 3 class hours. Credit, 3.

91. Intermediate Calculus

Series, expansion of functions, partial differentiation, and multiple integrals. Prerequisite, Mathematics 30. 3 class hours. Credit, 3.

92. Differential Equations

Prerequisite, Mathematics 91. 3 class hours. Credit, 3.

93. (I) Fourier Series and Orthogonal Functions

Solutions of boundary value problems by Fourier series, Bessel functions, Legendre polynominals; convergence of representations by orthogonal functions. Prerequisite, Mathematics 92 or 32. 3 class hours. Credit, 3.

97. (I) 98. (II) Advanced Topics

Several topics intended for individuals or small groups of students. Admission by permission of the Head of the Department. Credit, 1, 2, or 3 each semester.

MICROBIOLOGY

Head: Professor C. D. Cox. Assistant Professors Canale-Parola, Czarnecki, Mortlock; Miss Boggs.

The major program in microbiology is designed to offer students sound preparation for more intensive graduate study and research in microbiology, as well as basic preparation for a wide variety of positions as microbiologists in research and non-research laboratories. In either event microbiology majors should immediately begin preparation in chemistry. Microbiology majors are required to have broad training in collateral sciences, and minimum requirements include chemistry through quantitative analysis and organic, and one year each of introductory biological science, physics, and mathematics. Those students contemplating graduate study will be advised to emphasize stronger training in these collateral sciences, which is basic and essential for

understanding and mastery of advanced graduate courses in microbiology. All students majoring in microbiology are required to take courses, Microbiology 51, 54, 55, 66, 95, and 96, and one other course in microbiology. Courses in microbiology are designed to offer fundamental training in the basic core areas and disciplines of this field.

1. (I) and (II) Introductory Microbiology

General and broad considerations of microorganisms, their activities, and their significance to human and animal health. Not for major credit. 2 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Czarnecki.

51. (I) General Microbiology I

General considerations of microbial structure, growth, and physiology and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and other science majors. Prerequisites, at least one year of chemistry, one year of biological science. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Canale-Parola, Mr. Mortlock.

54. (II) Pathogenic Bacteriology

Correlation of physiologic and metabolic properties and processes of bacteria with the patheogenesis of disease. Prerequisite, Microbiology 51. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Cox, Miss Boggs.

55. (I) Immunology

Fundamental study of the nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity. Prerequisite, Microbiology 51. 2 class hours. 2 3-hour laboratory periods. Credit, 4. Mr. Cox, Miss Boggs.

57. (II) Virology

The structure, and the chemical, physical and biological properties of viruses, with emphasis on the bacterial viruses. Prerequisite, Microbiology 51. 2 class hours, 2 3-hour laboratory periods. Credit, 4.

64. (I) General Microbiology II

Principles of selective enrichment and isolation; morphological, physiological and ecological characteristics of a number of bacterial groups isolated from nature. Prerequisite: Microbiology 51. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Canale-Parola.

66. (II) Microbial Physiology

Fundamental study of the growth, nutrition, metabolism and respiration of microorganisms. Prerequisites, Microbiology 51 and courses in organic and/or biochemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Mortlock.

95, 96. (I) and (II) Seminar. Prerequisite, Microbiology 51. Credit, 1

97, 98. (I) and (II) Special Problems. Prerequisite, Microbiology 51

4 additional credits, and departmental permission. Credit, 2-4.

MUSIC

Head of Department: Professor Philip Bezanson. Professors Alviani, King; Assistant Professors Contino, Jenkins; Messrs. Schwartz, Steele.

The undergraduate major program in music is pre-professional, so that courses, music organizations, and private study are the means

used to prepare each student. Other undergraduates may minor in music, or follow a sequence of courses for continuing study. Each major must concentrate on one of the following areas. (1) Music History and Literature, (2) Music Theory, (3) Applied Music (vocal and/or instrumental performance). A core program of courses for all music majors includes Music Theory 3, 4, 5, 6, Music History 53, 54, (59 or 62 or 64), Applied Music 13-20. Three additional credits will be required of each major in music in Theory, or Music History, or Applied Music, depending on the area of concentration. Students in applied music will prepare a recital program and perform it during the senior year.

Candidates for Certification as teachers of music in elementary and secondary schools need Education 51, 52, 85; Psychology 56; Music 81, 82, 83, 87, and some study in conducting. The applied music requirements in the core program of courses are to increase or give competence in playing a piano keyboard, and to improve proficiency with the singing voice and/or the playing of an instrument. Each major must perform a minimum of four semesters with a musical organization, participating in one each of the instrumental, choral, or musical theatre groups. Majors will be expected to register for as many courses as possible in philosophy, art, theatre, literature (not exclusively English), psychology, religion, and recreation.

1. (I) (II) Music Appreciation — Introduction to Music

Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and the cultural significance of representative works from the ninth Century to the present are studied and discussed. 3 class hours. Credit, 3.

3. (I) 4. (II) Elementary Music Theory

A study of diatonic harmony, and the development of skills in sight singing, ear training, and analysis of musical forms. Prerequisites: Ability to read music, elementary skill at playing the piano, or permission of the instructor. Music 3 prerequisite to Music 4. Credit, 3.

5. (I) 6. (II) Intermediate Music Theory

Chromatic harmony, including further studies in sight singing and ear training. Counterpoint in both 16th Century and 18th Century styles. Further analysis of musical forms, including contrapuntal forms. Introduction to orchestration, and practice in writing original compositions for instrumental ensembles. Prerequisite, Music 4 or its equivalent. Music 5 prerequisite to Music 6. Credit, 3.

12. (I) (II) Applied Music — Individual Instruction*

The study of piano, voice, or an instrument to gain proficiency. The course may be repeated several times until credit level is achieved. A grade is recorded. 7½ hours or its equivalent. Credit, 0.

13. (I) 14. (II) Applied Music — Individual Instruction*

A study of literature and instrumental technique or voice production. Prerequisite, intermediate level of proficiency as determined by examination. 7½ hours or its equivalent. Credit, 1.

**Arrangement for assignment to applied music courses must be made at the Department of Music office.*

15. (I) 16. (II) Applied Music — Individual Instruction

Further study of literature and instrumental technique or voice production. Prerequisites, Music 13, 14. 7½ hours or its equivalent. Credit, 1.

17. (I) 18. (II) Applied Music — Individual Instruction

Advanced study of literature and instrumental technique or voice production. Prerequisites, Music 15, 16. 7½ hours or its equivalent. Credit, 1 each semester.

19. (I) 20. (II) Applied Music — Individual Instruction

Advanced study of literature and instrumental technique or voice production. Prerequisites, Music 17, 18. 7½ hours or its equivalent. Credit, 1 each semester.

21. (I) (II) 22. (I) (II) Applied Music — Instrumental Ensemble*

Study and preparation for performance of compositions of instrumental music written in many styles and in various media. One credit recorded on completion of 21, 22. The sequence 21, 22 may be repeated. Credit, 1 for each two semesters. Mr. Contino.

23. (I) (II) 24. (I) (II) Applied Music — Vocal Ensemble*

Preparation of various choral works to concert standard. Additional opportunities for instrumental accompanists and vocal soloists. 1 credit recorded on completion of 23, 24. The sequence 23, 24 may be repeated. Music 23 prerequisite to Music 24. Admission only by permission of instructor. Credit, 1 for each two semesters. Mr. King.

53. (I) 54. (II) Music History — Historical Survey of Music

History and literature of music: Music 53, from early religious chant through Bach and Handel; Music 54, from 1750 through vocal and instrumental music of the 20th Century. Prerequisite, Music 1. 3 class hours. Credit, 3.

55. (I) Music History — Music from Monteverdi to Bach

The Baroque and Rococo periods, including the music of such composers as Monteverdi, Schutz, Lully, Purcell. Corelli,Couperin, Rameau, the Scarlattis, Bach, Handel. 3 class hours. Credit, 3. Perequisite, Music 54.

57. (I) Music History — Gothic and Renaissance Music

Chant and organum through Renaissance motet and madrigal. Reading, listening, score study, analysis. Prerequisite, Music 55. 3 class hours. Credit, 3.

59. (I) (II) Music History — Music of the 20th Century

A study of music, both European and American, written since 1900, including Stravinsky, Bartok, Hindemith, Copland, jazz, electronic music. Prerequisite, Music 1. 3 class hours. Credit, 3.

62. (II) Music History — Haydn, Mozart and Beethoven

Reading, listening, score study. 3 class hours. Credit, 3. Prerequisite, Music 1.

64. (II) Music History — Music from Schubert to Debussy

An historical study of 19th Century romantic music in small and large forms, and various media including Lieder, chamber music, symphony, opera. Reading, listening, score study. Prerequisite, Music 54. 3 class hours. Credit, 3.

71. (I) 72. (II) Music Theory — Form, Analysis, and Composition

Analysis by score and sound, of textures and forms of various styles. Music 72 includes practice in original composition in various forms and media. Prerequisite, Music 6 or equivalent. Music 71 prerequisite to Music 72. 3 class hours. Credit, 3.

**Arrangement for assignment to applied music courses must be made at the Department of Music office.*

73. (I) 74. (II) Music Theory — Harmonic and Contrapuntal Techniques

A continuation of Music 72. Systematic study of chromatic harmony; use of various contrapuntal procedures. Some study of 20th Century styles and opportunities for free composition. Playing and score reading. Prerequisite, Music 72 or equivalent. Music 73 prerequisite to Music 74. 3 class hours. Credit, 3.

81. (I) Music Education — Basic Instrumental Music — Woodwinds

Tone production, technical dexterity, acoustical principles of the woodwind family with emphasis given to the clarinet, flute, oboe, bassoon. Literature and materials studied and evaluated. Prerequisite, Music 4. 3 class hours. Credit, 2.

82. (II) Music Education — Basic Instrumental Music — Brasswinds and Percussion

Tone production, technical dexterity, acoustical principles of the brasswind and percussion groups with emphasis given to the cornet, French horn, trombone, and tuba. Literature and materials studied and evaluated. Prerequisite, Music 4. 3 class hours. Credit, 2.

83. (I) Music Education — Basic Instrumental Music — Strings

Tone production, technical dexterity, acoustical principles of the string family with emphasis on the violin, viola, and cello. Literature and materials studied and evaluated. Prerequisite, Music 4. 3 class hours. Credit, 2.

85. (I) (II) Music Education — Music for Elementary Teachers

For the classroom teacher having little or no formal training in music. Principles of musical development with particular emphasis on classroom presentation. Rote and reading songs examined; processes of presentation evaluated. 3 class hours. Credit, 3.

87. (I) (II) Music Education — Music Curriculum

Organization and administration of the music program and curriculum in the elementary and secondary school. Observation of area schools. Admission by permission of instructor. 3 class hours. Credit, 3.

89. (I) Music Education — Score Reading and Conducting

Open and closed scores are studied, analyzed, and played at the keyboard. Basic conducting techniques are applied to the material studied. Prerequisite, Music 4. 3 class hours. Credit, 3.

90. (II) Music Education — Score Reading and Conducting

Band, orchestral, and choral scores are studied, analyzed and conducted. As scheduling permits, choral and instrumental organizations are utilized for actual conducting. Prerequisite, Music 4. 3 class hours. Credit, 3.

PHILOSOPHY

Head of Department: Professor Clarence Shute. Professors Moore, Oppenheim (Government); Associate Professor Swanson; Assistant Professor Ehrlich; Messrs. Brentlinger, Clay.

Philosophy seeks a comprehensive understanding of the various areas of man's experience in their interrelatedness. In the context of the historically important theories, the courses concentrate on methods of inquiry into the persisting questions of philosophy, standards of thought, clarification of ethical and aesthetic values, and the basis of criticism.

Students majoring in philosophy will complete a minimum of 30 semester hours of credit in courses offered by the department, exclusive of honors work. Normally there should be included 25, 31, 42, 53-56, and at least one course from 92, 95-98.

Philosophy is closely related to many other academic disciplines; it is therefore advisable for every student majoring in this field to carry his study of one other area to a depth sufficient for the exploration of its relations with philosophy. When desirable for this purpose, the minimum of 30 credits in philosophy may be reduced, with departmental approval, to 24. Within the limits of the desirable concentration suggested above, a wide range of supplementary courses is advised among which the following are suggested as typical: Anthropology 63; Art (historical courses); Chemistry 88; Education 51; English 63, 64, 72; French 51; German 56, 57; Government 66, 71, 72; Mathematics 53, 54; Music (historical courses); Psychology 61, 90; Sociology 82; Speech (historical courses).

For an introduction to the field as a whole, it is advised that a course be selected from 25, 42, 51 and/or 52; but students planning to take advanced work will do well to select from 25, 42, 53-56.

25. (I) and (II) Introduction to Philosophy

An inquiry into the nature of critical thinking, including (1) the functions of language, (2) the structure of deductive arguments, (3) a glimpse at inductive methods. 3 class hours. Credit, 3. Messrs. Swanson, Clay.

31. (I) and (II) Introduction to Logic

An inquiry into the nature of critical thinking, inductive (1) the functions of language, (2) the structure of deductive arguments, (3) a glimpse at indicative methods. 3 class hours. Credit, 3. Messrs. Swanson, Clay.

42. (I) and (II) Ethics

An examination of classical and contemporary theories concerning policy formation and the justification of personal decision and ways of life. Prerequisites, none. 3 class hours. Credit, 3. Messrs. Ehrlich, Clay, Brentlinger.

51. (I) History of Philosophy—Ancient and Medieval

The development of Western thought from its earliest beginnings to the flowering of medieval scholasticism. Emphasis on the contribution of important movements and great thinkers. 3 class hours. Credit, 3. Mr. Brentlinger.

52. (II) History of Philosophy—Modern

Continuation of Philosophy 51 from the Renaissance and the rise of modern science to 19th century idealism, positivism and voluntarism. 3 class hours. Credit, 3. Mr. Brentlinger.

53. (I) Plato and Aristotle

The major works of Plato and Aristotle in ethics, logic, and metaphysics will be read for the systematic character of their thought and its contemporary relevance. Prerequisites, none. 3 class hours. Credit, 3. Mr. Brentlinger.

54. (II) Philosophy in the Middle Ages

The writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought. Prerequisites, none. 3 class hours. Credit, 3. Mr. Ehrlich.

55. (I) European Philosophy from Montaigne to Rousseau

A study of representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal. Prerequisites, none. 3 class hours. Credit, 3.

56. (II) British Philosophy from Bacon to Hume

A study of representative philosophical texts, with emphasis on Locke, Berkeley, and Hume; their historical influence, especially on contemporary empiricism. Prerequisites, none. 3 class hours. Credit, 3. Mr. Clay.

61. (I) Contemporary Analytic Philosophy

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine. Prerequisites, one semester course in philosophy. 3 class hours. Credit, 3. Mr. Clay.

64. (II) Existential Philosophies

Examination by means of a study of selected original texts, of the main problems peculiar to this movement as a whole and to its main exponents individually. Prerequisites, Philosophy 25 and permission of the instructor, or one course from 51-56. 3 class hours. Credit, 3. Mr. Ehrlich.

67. (II) American Philosophy

Examination, by means of a study of selected original texts by the outstanding American philosophers, of their contribution to western thought and American civilization. Prerequisite, one course from 25, 51-56. 3 class hours. Credit, 3. Mr. Moore.

68. (I) Oriental Philosophies

The leading philosophies of Asia with emphasis on India and the bearing of philosophical differences between East and West on the problem of mutual understanding. Prerequisite, one course in philosophy (exclusive of logic). 3 class hours. Credit, 3. Mr. Shute.

72. (II) Philosophy of Science

A critical analysis of the structure of scientific method and the language of science, the respective roles of induction and deduction in science, and the status of theoretical terms. 3 class hours. Credit, 3. Mr. Swanson.

75. (I) Mathematical Logic

Turing machines, theory of computability, effective procedures, combinatorial systems, natural deduction, completeness of quantification theory. Prerequisite, Philosophy 31 or consent of the instructor. 3 class hours. Credit, 3. Mr. Swanson.

76. (II) Theory of Formal Systems

Equivalence, completeness, incompleteness, decision procedure, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic. Prerequisite, Philosophy 75, its equivalent, or the instructor's approval. 3 class hours. Credit, 3. Mr. Clay.

81. (I) Philosophy of Religion

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience. 3 class hours. Credit, 3. Mr. Shute.

82. (II) Aesthetics

Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism. 3 class hours. Credit, 3. Mr. Shute.

84. (I) Political Philosophy

A systematic approach to major controversies in philosophy of political science and political ethics; e.g., rationalism vs. empiricism, natural law vs. legal positivism. Prerequisite, one semester course in philosophy, or the approval of the instructor. 3 class hours. Credit, 3. Mr. Oppenheim.

91. (I) Contemporary Problems

A consideration of selected persistent philosophical problems — e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc. Prerequisite, permission of the department. 3 class hours. Credit, 3. Mr. Clay.

95. (I), 96. (II). Seminar

A study of one major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry. Prerequisite, approval of the instructor. 3 class hours. Credit, 3. The Staff.

97. (I), 98. (II)

Individual study of a selected problem in philosophy, with written report of results. Prerequisite, permission of the department. Credit, 3. The Staff.

PHYSICS

Head of Department: Professor Robert L. Gluckstern. Professors Rosen, Ross, Trimmer; Associate Professors Foland, Jones, Soltysik; Assistant Professors Kang, Mathieson, Patten, Sastry; Messrs. Chanmugam, Crooker, Gray, Hays, Haussler.

Courses are designed to accommodate students who desire specialized training in physics, and also to provide required or elected courses for students majoring in engineering, mathematics, chemistry, or other fields. Majors should take Mathematics 9, 10, 25, 26, beginning if possible at the start of the freshman year. The preferred start in physics is in Physics 8, 9 a restricted enrollment course for physics majors, beginning with the second semester of the freshman year. In some cases the (first freshman semester, or later) choice of Physics 5, 6, 7 or of Physics 3, 4 may be advisable or acceptable. Selection of the first physics course should be made in consultation with an adviser from the Physics Department. The freshman year should include Chemistry 1, 2 or, for students who may wish to include considerable chemistry in their later studies, Chemistry 3, 4. (For B.A. degree candidates, this means that the History 5, 6 requirement must be met later.) Required upper-division courses are Physics 51, 52, 55, 56, 85, 86. Mathematics courses should include advanced calculus, differential equations, and vector analysis.

3. (I) 4. (II) Introductory Physics

Mechanics, Sound, Heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for premedical, predental, preveterinary, and some science major students. Prerequisites, Mathematics 4 previously or concurrently for Physics 3; Physics 3 for Physics 4. 3 class hours, 1 2-hour laboratory period. Credit, 4.

5. (I) General Physics

Mechanics. For students primarily interested in physics, engineering, chemistry, or mathematics, who, in general, have had high school physics. Prerequisite, Mathematics 5 previously or concurrently. 2 class hours, 1 2-hour laboratory period. Credit, 3.

6. (II) General Physics

Heat, electricity, and magnetism. Prerequisites, Mathematics 5; Physics 5; Mathematics 6 concurrently. 2 class hours, 1 2-hour laboratory period. Credit, 3.

7. (I) (II) General Physics

Electromagnetic radiation, atomic and nuclear physics. Prerequisites, Mathematics 6; Physics 6. 3 class hours, 1 2-hour laboratory period. Credit, 4.

8. (II) 9. (I) Advanced Introductory Physics for Physics Majors

A limited-enrollment course for Physics majors or others interested in an introductory course at an advanced level. Prerequisites, Mathematics 4 or 5 or 29, and consent of Physics Department. 3 class hours, 1 2-hour laboratory period. Credit, 4.

51. (I) 52. (II) Electricity and Magnetism

The basic phenomena and laws of electricity and magnetism. Measurement, with an introduction to circuitry and electronics. Prerequisites, Physics 4, and Mathematics 30 or 31 for Course 51; Course 51 for Course 52. 2 class hours, 1 2-hour laboratory period. Credit, 3.

54. (II) Meteorology

Theoretical treatment of various atmospheric phenomena, with correlation of observation and theory. Weather observations, preparation of weather charts, and weather forecasting. Prerequisites, Physics 4 or 6; Mathematics 30 or 31. 3 class hours. Credit, 3.

55. (I) 56. (II) Mechanics

Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation. Prerequisites, Physics 4 or 6; Mathematics 30 or 31. 3 class hours. Credit, 3.

60. (II) Sound and Acoustics

Vibrations, coupled systems, sound structure, and acoustic properties; principles and applications. Prerequisites, Physics 4 or 7; Mathematics 30 or 31. 3 class hours. Credit, 3.

61. (II) Heat and Thermodynamics

Heat exchanges and related energy changes in systems of matter. Prerequisites, Physics 4 or 6; Mathematics 30 or 31. 3 class hours. Credit, 3.

63. (II) Optics

An intermediate course in geometrical and physical optics. Prerequisites, Physics 4 or 7; Mathematics 30 or 31. 2 class hours, 1 2-hour laboratory period. Credit, 3.

66. (I) Kinetic Theory

Classical kinetic theory of gases, with an introduction to phenomena in the non-uniform gas. Prerequisite, Physics 55. 3 class hours. Credit, 3.

67. (II) Statistical Mechanics and Information Theory

A study of the concepts of entropy, information, and order. Prerequisite, Physics 61. 3 class hours. Credit, 3.

85. (I) 86. (II) Modern Physics

Twentieth-century physics, the first semester devoted principally to atomic aspects, the second to nuclear. Prerequisites, Physics 52, 55, 56. 3 class hours. Credit, 3.

88. (II) Solid State Physics

An introduction to theoretical and experimental physics of the solid state. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

91. (II) Gaseous Electronics

Electrical conduction in gases, interactions of space charge and electro-magnetic waves, plasmas. Prerequisite, Physics 52. 3 class hours. Credit, 3.

97. (I) 98. (II) Advanced Experimental Work

Selected experiments and projects are investigated, according to the needs of the individual student. Prerequisites, Physics 51 or 55. 3 2-hour laboratory periods. Credit, 1 to 3.

PSYCHOLOGY

Head: Professor Claude C. Neet. Professors Epstein, Feldman, Field, Goss, Kates, Southworth, Teichner; Associate Professors Berenson, Myers; Assistant Professors Budoff, Dzendolet, Harrison, Jarmon, Lewit, Moore, Price, Schumer; Mr. Manley, Mr. Wagner; Research Associates Mrs. Jensen, Mrs. Myers, Mrs. Suydam, Messrs. Burstein, Fenz, Seibel; Visiting Lecturers Cohen, Shapiro, L. Simon, W. Simon, Snoek, Sollenberger, Trehub.

The courses in the Psychology Department are planned (1) to impart an understanding of the basic principles, methods and data of psychology as a science and the application of this knowledge to problems of human adjustment; (2) to prepare some majors for graduate study which may lead to a professional career in psychology; and (3) to help prepare others for non-professional careers. In carrying out these aims, majors are urged to elect, with the help of a departmental adviser, a broad program of courses. Careers open to psychology majors include: guidance and counseling, psychometrics, child welfare, clinical psychology, school psychology, social work, statistical analysis, opinion polling, personnel and industrial work, engineering psychology, secondary school teaching, college and university teaching and research, and research in federal and state agencies. Graduate training is required for certain of these careers.

Majors must elect Psychology 5 and 6 in the freshman year and any two of Psychology 51, 52, 53 and 63 in the sophomore year. Students taking Psychology 1 who then decide to major in psychology go directly into Psychology 5 or 6. Statistics 50 in the sophomore year and Psychology 90 in the senior year are required. In addition, at least one course must be elected from each of three of the following groups: (1) Psychology 61, 62, 65, 66, 67; (2) Psychology 72, 75; (3) Psychology 79, 81, 82, 83, 92; (4) Psychology 56, 85, 86, 87, 88. Each student must elect a minimum of 24 and a maximum of 30 sophomore-junior-senior credits in psychology.

Students planning to teach at the secondary school level should take a minor in Education and have certain courses in Biology, Government, and Sociology. They should also take History 5, 6, 25 and 26. Education 51, and Psychology 56 are required during the junior year and Education 52, 85, and 88 (the secondary block) during one semester of the senior year. By taking appropriate programs of courses, psychology majors may qualify for either the Bachelor of Arts or the Bachelor of Science degree.

1. (I) (II) General Psychology

An introduction to the principles and study of behavior. Topics considered include development of behavior, sensation, learning, thinking, motivation, intelligence, attitudes, and personality. 3 class hours. Credit, 3. Mr. Feldman, Mr. Price, Mr. Wagner.

5. (I) General Psychology I

Introduction to basic concepts and methods of psychology. Topics include neural mechanisms, sensation, perception, emotion and motivation, learning and thinking, and problem solving. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wagner.

6. (II) General Psychology II

A continuation of Psychology 5. Topics include intelligence, human development, attitudes, conflict, personality, group processes, and personality change. Prerequisite, Psychology 1 or 5. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Epstein.

28. (II) Psychology of Adjustment

Problems of personality development and adjustment are emphasized. Psychological nature of man, conflict, fantasy and thinking, and adjustment. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Kates.

51. (I) Sensation and Perception

A study of the data, theories and methods of studying sensation and perception. Prerequisites, any two of Psychology 1, 5, 6; or 1 or 5 and consent of instructor. 2 class hours, 1 2 hour laboratory period. Credit, 3. Mr. Dzendolet.

52. (II) Learning and Thinking

A consideration of the effects of practice and conditions of practice on acquisition, generalization, discrimination, transfer, retention and extinction phenomena. Prerequisites, any two of Psychology 1, 5, 6; or 1 or 5 and consent of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Moore.

53. (II) Motivation

The data, theories and the methods of investigating motivation. Topics include primary drives, emotions, frustration and conflict, and learned drives. Prerequisites, any two of Psychology 1, 5, 6; or 1 or 5 and consent of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wagner.

56. (I) (II) Educational Psychology

Psychological facts and principles of development, learning and measurement as applied to educational situations. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Schumer.

61. (I) Social Psychology I

Development, interrelationships, and functions of attitudes. Emphasis upon religions and political behavior, psychoanalytic and behavioristic theories of prejudice, attitude measurement, propaganda, group persuasion. Survey project. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Lewit.

62. (II) Social Psychology II

Individual behavior in groups. Interpersonal perception and communication. Norms, power, leadership, and coalition formation. Individual motivation and group problem-solving. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Lewit.

63. (I) Physiological Psychology

The neurophysiological bases of behavior. The structural and functional relationships among the nervous system, sense organs and drives. Prerequisites, Psychology 1 or 5; Zoology 35. 3 class hours. Credit, 3. Mr. Feldman.

65. (I) (II) Child Psychology

The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Price.

66. (I) Psychology of Adolescence

A consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Price.

67. (I) Introduction to the Study of Exceptional Children

Emphasis is on the etiology, diagnosis, characteristics, education and prognosis of deviations in mental, physical and socio-emotional development. Prerequisites, Psychology 1 or 5, 65, or consent of the instructor. 3 class hours. Credit, 3. Mr. Budoff.

72. (II) Advanced Experimental Psychology

The literature, techniques, and apparatus of experimental psychology. Selected projects carried out individually by the members of the class. Prerequisites, Psychology 51 or 52, or 53; Zoology 35. 1 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Dzendolet.

75. (I) Statistics in Psychology

The application of statistical procedures to the analysis of psychological data and to problems of measurement in psychology and related fields. Prerequisites, Psychology 1 or 5; Statistics 50 or 56. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Myers.

79. (I) Personality

An introduction to the scientific study of personality. Topics include psychoanalytic and cognitive approaches, the influence of social-cultural conditions, personality types and learning. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Kates.

81. (I) Psychological Tests

Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationale, construction, characteristics, uses and evaluation are emphasized. Prerequisite, Psychology 1 or 5. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Schumer.

82. (I) and (II) Psychological Tests

A study of theories of intelligence and of individual intelligence tests. Prerequisite, Psychology 1 or 5. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Budoff and Mr. Harrison.

83. (I) Abnormal Psychology

The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Neet.

85. (I) Industrial Psychology I

Psychological principles underlying personnel selection and training, communication and decision-making in industry. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Teichner.

86. (II) Industrial Psychology II

Principles and applications of human factors data related to the analysis, design, evaluation and use of man-machine systems and equipment. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Teichner.

87. (I) Psychology of Occupations

A study of interests, abilities and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized. Prerequisite Psychology 81. 3 class hours. Credit, 3. Mr. Field.

88. (II) Theories and Techniques of Counseling and Guidance

The theories, techniques and tests necessary in counseling and guidance. Practice in organizing and evaluating relevant data in the analysis of illustrative cases. Prerequisite, Psychology 81, or permission of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Berenson.

90. (II) Contemporary Psychologies

A logical, historical, and systematic analysis of contemporary psychological theories, including structuralism, functionalism. Gestalt and organistic psychologies, psychoanalysis, and behaviorisms. Prerequisite, Psychology 1 or 5. 3 class hours. Credit, 3. Mr. Goss.

92. (II) Clinical Psychology

An introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual. Prerequisite, Psychology 83 or consent of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Epstein.

97. (I) 98. (II) Problems in Psychology

For qualified seniors. Independent work on special problems or in certain fields of psychological interest. By arrangement with the members of the department. Credit, 1-3.

ROMANCE LANGUAGES

Head of Department: Professor Robert E. Taylor. Professors Goding, Johnson; Associate Professors Greenfield, Mankin, Rothberg, Wexler; Assistant Professors Araujo, Boudreau, Haddad, Jaeger, Raymond, Smith; Mesdames Bradford, Burkhardt, Cannon, Miller, Swaney, Misses Abadie, Butler, Danahar, Mora, Post, Rozier, Sayed, Messrs. Aliberti, Busi, Lamontagne, MacCombie, Niedzielski, Schneiderman, Schwartz.

Two majors are offered: French and Spanish. The courses of these two curricula are intended to give (1) a thorough training in the language skills, (2) an appreciation of the aesthetic and intellectual qualities of the literatures, and (3) a serious insight into the cultures of the nations concerned. Students majoring in French or Spanish are required to complete 30 approved junior-senior credits, six of which may be in English literature above 25-26 or in the original literature of another foreign language, or in other courses approved by the Department. Majors should also be guided by the appropriate Departmental document: *Requirements for the Major in French (Spanish).*

FRENCH

1. (I) 2. (II) Elementary French

For those who have had no previous creditable training in French. Intensive practice in the four language skills. Sequence: French 1, 2, 7, 8. 3 class hours, 2 laboratory periods. Credit, 3.

3. (I) and (II) Non-Credit French

An intensive review of basic matter. For students who have had some French but who 1) have failed to achieve the minimum passing placement test score for French 7, 2) present only a single year of secondary school French, or 3) are deemed unprepared for French 7 by the department. Sequence: French 3 (non-credit), 7, and 8. Credit, 3.

7. (I) and (II) Intermediate French; French Life and Culture

An intensive review and study of the language. Readings in modern French literature. Sequence: French 7, 8. Prerequisite, French 2 or equivalent. 3 class hours, laboratory. Credit, 3.

8. (I) and (II) Intermediate French; French Life and Culture

A study of some important literary works of the 19th and 20th centuries. Compositions. Prerequisite, French 6 or 7. 3 class hours. Credit, 3.

25. (I) 26. (II) Great Works in French Literature

A study of selected complete works of several periods. 3 class hours, 1 laboratory hour. Credit, 3.

27. (I) 28. (II) Oral Practice

An advanced-level course designed to bring students to an accurate and mature grasp of French thought and expression. 3 class hours, 2 laboratory hours. Credit, 3. Mr. Smith, Mr. MacCombie.

51. (I) French Literature of the Eighteenth Century

Development of the ideas of the French Enlightenment. Given in alternate years. 3 class hours. Credit, 3. Mr. Taylor.

53. (I) The French Theater of the Twentieth Century

A critical study of the French theater from Scribe to the present. Given in alternate years. 3 class hours. Credit, 3.

55. (I) French Literature of the Seventeenth Century

A study of the major works of pre-classicism, classicism and the transition, except the theater. Given in alternate years. 3 class hours. Credit, 3. Mr. Johnson.

56. (II) French Literature of the Seventeenth Century: Theater

A study of French drama in the seventeenth century. Given in alternate years. 3 class hours. Credit, 3. Mr. Johnson.

57. (I) French Romanticism

A study of the Romantic period. Given in alternate years. 3 class hours. Credit, 3. Mr. Goding.

58. (II) French Literature of the Nineteenth Century

A study of the main genres, schools and movements after the Romantic period. Given in alternate years. 3 class hours. Credit, 3. Mr. Goding.

59. (I) Major Figures of the Contemporary French Novel

A study of the novels of Romains, Martin du Gard, Duhamel, Gide, Proust, Montherlant, Giraudoux. Credit, 3. Miss Jaeger.

60. (II) Major Figures of the Contemporary French Novel

A study of the novels of Malraux, Camus, Sartre, Simone de Beauvoir, Bernanos, Mauriac and Julion Green. Credit, 3. Miss Jaeger.

65. (I) or (II) Masterpieces in Translation

The vision of man in French literature from the Renaissance to the XXth century. Not open to French majors or to students who have completed either French 25 or French 26. 3 class hours. Credit, 3. Miss Jaeger.

77. (I) The French Renaissance

A study of the major writers of the XVIth century with appropriate attention to important humanistic and artistic developments. 2 class hours. Credit, 3.

78. (I) or (II) Advanced French Studies

A special study of a French author or genre under independent guidance. Elected only by permission of the department. Credit, 1-3. The Staff.

79. (I) French Civilization

A course designed for an intelligent understanding of France's life and culture. Given in alternate years. 3 class hours. Credit, 3. Mr. Mankin.

80. (II) Advanced Language Study

A thorough examination of professional requirements and needs for the teaching of French in the U. S. 3 class hours. Credit, 3. Mr. Goding.

81. (I) Contemporary French Poetry

The works of Nerval, Baudelaire, Mallarmé, Rimbaud, Verlaine, etc. Credit, 3. Mr. Johnson.

82. (II) Contemporary French Poetry

The works of Valéry, Claudel, Apollinaire, Saint-John Perse, etc. Credit, 3. Mr. Johnson.

96. (I) or (II) Senior Seminar

Advanced study in French literature for advanced students. Subject of the seminar is announced the preceding semester. Credit, 1-3. The Staff.

ITALIAN

1. (I) 2. (II) Elementary Italian

For students with no previous creditable training in Italian. Intensive practice in the language skills. 3 class hours, 2 laboratory sessions. Credit, 3. Mr. Aliberti.

7. (I) 8. (II) Intermediate Italian

For students with one year of college Italian or equivalent. Training in the language skills; emphasis on speaking and understanding; readings in cultural and literary texts. 3 class hours, 2 laboratory sessions. Credit, 3. Mr. Aliberti.

25. (I) 26. (II) Introduction to Italian Literature

Selected masterpieces of Italian literature presented integrally, in literary-historical perspective. Conducted in Italian. Either semester may be elected independently. Prerequisites, Italian 7, 8 or permission of the department. 3 class hours. Credit, 3.

27. (I) 28. (II) Oral Italian

The oral aspect of the language; pronunciation, vocabulary building, speeches, discussions, debates. Prerequisites, Italian 7, 8 or permission of the department. 3 class hours, laboratory. Credit, 3.

PORTUGUESE

1. (I) 2. (II) Elementary Portuguese

For students with no previous creditable training in Portuguese. Intensive practice in the language skills. 3 class hours, laboratory. Credit, 3. Mr. Araujo.

7. (I) 8. (II) Intermediate Portuguese

For students with one year of college Portuguese or equivalent. Training in the language skills; emphasis on speaking and understanding: readings in cultural and literary texts. 3 class hours, laboratory. Credit, 3. Mr. Araujo.

25. (I) 26. (II) Introduction to Portuguese Literature

Selected masterpieces of Portuguese literature presented integrally, in literary-historical perspective. Conducted in Portuguese. Either semester may be elected independently. Prerequisites, Portuguese 5, 6, or permission of the department. 3 class hours. Credit, 3. Mr. Araujo.

SPANISH

1. (I) 2. (II) Elementary Spanish

For students with no previous creditable training in Spanish. Intensive practice in the language skills. To fulfill the language requirement, upon completion of this course most students are required to continue by taking Spanish 7 and 8. 3 class hours, 2 laboratory sessions. Credit, 3.

7. (I) 8. (II) Intermediate Spanish

For upperclassmen who have completed Spanish 1-2, and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 8 fulfill the language requirement. 3 class hours. Credit, 3.

25. (I) 26. (II) Introduction to Spanish Literature

Selected great works of Spanish literature studied in complete text in literary-historical perspective. Conducted in Spanish. Either semester may be elected independently. Prerequisites, Spanish 8, or permission of the department. 3 class hours. Credit, 3. Mr. Rothberg, Mr. Boudreau.

27. (I) 28. (II) Oral Spanish

The oral aspects of the language; pronunciation, vocabulary building, speeches, discussions, debates. Grammatical elements required for correct and fluent use of American and Peninsular Spanish. Prerequisites, Spanish 8, or permission of the department. 4 class hours. Credit, 3. Mr. Wexler.

64. (II) Advanced Composition and Syntax

Syntax and idioms, and those more advanced difficult elements which constitute stylistics. Required of juniors majoring in Spanish and open to other qualified students by permission of the department. 3 class hours. Credit, 3. Mr. Haddad.

66. (II) Spanish Masterpieces in Translation

A detailed study of select masterpieces of Spanish literature from the Middle Ages to the present. Not open to majors in Spanish nor to students who have taken or plan to take Spanish 25-26. 3 class hours. Credit, 3.

79. (I) Spanish Literature of the Nineteenth Century (1965-66)

A detailed study of the major writers and literary movements of the period. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25-26, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

80. (II) Spanish-American Literature to 1900 (1965-66)

Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

81. (I) Twentieth-Century Spanish Literature (1964-65)

Major writers of Spain in the late nineteenth and twentieth centuries. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

82. (II) Twentieth-Century Spanish-American Literature (1964-65)

Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

83. (I) Prose and Poetry of the Sixteenth Century (1964-65)

Masterpieces of Spanish prose of the 16th Century; development of poetry in the major poets from Garcilaso to Herrera. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

84. (II) Cervantes (1964-65)

Intensive reading of *Don Quijote*. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

85. (I) Drama of the Golden Age (1965-66)

Deals primarily with the *comedia* during the period of maximum creation, 1556-1681. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 and 26, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

86. (II) Prose and Poetry of the Seventeenth Century (1965-66)

Masterpieces of Spanish prose of the 17th Century, excluding the *Quijote;* Gongora and the Baroque poets. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 25 or 26, or permission of the department. 3 class hours. Credit, 3. Mr. Rothberg.

95. (I) Senior Seminar

Independent work under guidance on special problems in certain areas of interest, including research and bibliographical techniques. A senior course for Spanish majors. Credit, 3.

THE CLASSICS

Instructors in the Department of Romance Languages.

GREEK

1. (I) 2. (II) Elementary Greek (1964-65)

For students with no previous creditable study of Greek. Elements of the language and readings in prose and poetry. Given in alternate years. 3 class hours. Credit, 3.

7. (I) 8. (II) Intermediate Greek (1965-66)

For students with one year of college Greek or its equivalent. Intensive grammar review. Readings in Homer, Plato, and others. Given in alternate years. Prerequisites, Greek 1, 2, or equivalent. 3 class hours. Credit, 3.

LATIN

1. (I) 2. (II) Elementary Latin

For students with no previous creditable study of Latin. Elements of the language and introductory reading. 3 class hours. Credit, 3.

7. (I) 8. (II) Intermediate Latin

For students with one year of college Latin or its equivalent. Intensive grammar review. Introduction to Latin Literature: Cicero, Virgil, Ovid, Horace, Livy and others. Prerequisites, Latin 1, 2, or equivalent. 3 class hours. Credit, 3.

RUSSIAN

Assistant Professor Tikos

The curriculum in Russian is offered by the Department of German and Russian (see page 82).

Students choosing Russian as their field of major concentration will receive training in reading, writing, speaking and understanding the language, and a knowledge of Russian literature. Russian majors will also acquire the background in Russian history, government and economy necessary for an understanding of the literature and culture of the Russian people. Russian majors will be prepared to continue their education on the graduate level in the fields of Russian, Slavic Languages and Literatures, or Russian Area Studies. Russian majors who choose to become teachers or translators will have the necessary preparation and background in the history of the language, or experience in translating scientific, technical and academic material.

Prerequisite is the successful completion of four semester courses in the language (12 credits): Russian 1, 2, 7, 8 or the equivalent. Requirements for a major in Russian are the successful completion of:

(a) Four semester courses of language study at the junior-senior level (12 credits): Russian 61, 62, 71 and either 63 or 64.

(b) Five semester courses of Russian literature study at the junior-senior level (15 credits): Russian 51, 52, 53, 54, and one of 56, 57, 58.

(c) Seminar course Russian 97.

(d) Two semester courses in Russian History: History 55, 56.

1. (I) 2. (II) Elementary Russian

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training. 3 class hours, 1 laboratory hour. Credit, 3.

7. (I) 8. (II) Intermediate Russian

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites Russian 1 and 2. 3 class hours, 1 laboratory hour. Credit, 3.

51. (I) 52. (II) Introduction to Russian Literature

Survey course in Russian prose. Written reports. Conducted in English. Readings in English and Russian, research in Russian for majors. Prerequisite, junior standing. 3 class hours. Credit, 3.

52. (I) 54. (II) Dostoevsky and Tolstoy in their European Setting

Historical and literary background. Close text analyses. Student reports. Reading of selected works in the original required of Russian majors. Prerequisite, junior standing. 3 class hours. Credit, 3.

55. (I) Masterpieces of Russian Literature in Translation

A selection from classics of Russian romanticism and realism, culminating in novels of Dostoevsky and Tolstoy. Majors are required to read some texts in Russian. Prerequisite, junior standing. 3 class hours. Credit, 3.

56. (I) Russian Drama

Russian Drama in the originals, from the beginnings to the establishment of a Russian national repertoire and theatre. Plays of Ostrovskij, Chekhov, and Gorky. Prerequisites, Russian 7 and 8, or the equivalent. 3 class hours. Credit, 3.

57. (I) Soviet Literature

Beginnings and development of Soviet prose, drama, criticism from Gorki to Sholokhov and Pasternak. Conducted in English; no knowledge of Russian required. Majors are required to do research in Russian. Prerequisite, junior standing. 3 class hours. Credit, 3.

58. (I) Russian Poetry

Russian poetry in the originals: 19th century to the present: Classical Heritage, Golden Age, Utilitarian poetry, Proletarian verse, Modernism, Symbolism, Mysticism, Acmeism, Futurism, Imagism, Constructivism. Prerequisites, Russian 7 and 8, or the equivalent. 3 class hours. Credit, 3.

61. (I) 62. (II) Advanced Russian

Building vocabulary and improving reading ability through selections from the Classical and Soviet Periods. Compositions and classroom discussions in Russian on reading material are required. Prerequisites, Russian 7 and 8. 3 class hours, 1 laboratory hour. Credit, 3.

63. (I) Scientific Russian

Intensive experience in translating scientific exposition, academic and journalistic prose. Prerequisites, Russian 7 and 8, or the equivalent. 3 class hours. Credit, 3.

64. (I) The History of the Russian Language

Historical development of the Russian language, its relation to other languages, changes in sound, form and vocabulary from the earliest period to the present. Prerequisites, Russian 61 and 62. Junior or senior standing. 3 class hours. Credit, 3.

71. (I) Russian Conversation

A semester course devoted to developing fluency in speaking Russian and a conversational vocabulary. Prerequisites, Russian 61 and 62. 3 class hours, 1 laboratory hour. Credit, 3.

97. (I) Problems in Russian Language and Literature

A semester involving intensive and independent work on special problems in Russian Language and Literature, with results to be presented in written form. Required of majors. Prerequisites, Advanced Russian 61 and 62 and senior standing. Credits, 1-3.

SOCIOLOGY AND ANTHROPOLOGY

*Head: Professor J. Henry Korson. Professors Gordon, King, Visiting Professor Mair; Associate Professors Driver, Sussmann, Wilkinson; Assistant Professors Fortier, Fraser, Kay, Lopreato**, *Manfredi, O'Rourke, Park, Stanfield; Visiting Assistant Professors Golden, Rose; Mr. Bick.*

*On leave 1963-64

Sociology and Anthropology

The courses in sociology and anthropology are planned with two aims in view: to give the student an understanding of the factors which influence men in their activities and interests as members of society, and to help prepare students for a wide variety of occupational outlets. Students interested in teaching at the elementary or high school level should take a minor in the School of Education and at least 6 credits in American history with as many credits in American government as can be arranged.

Of the many opportunities in the field of social work, some are available to college graduates while others require graduate training in a school of social work. Aside from opportunities in the business world, many federal agencies and private research organizations seek people who are trained in the research techniques of sociology.

All majors must elect Sociology 1 and 2; Mathematics 1 and 2, or Mathematics 1 and Philosophy 31; and two of the following: Economics 25, Government 25, or Psychology 1; a minimum of 24 and a maximum of 30 Junior-Senior credits in Sociology and Anthropology, of which the following should be taken in the Junior year: Anthropology 3, Sociology 82, and 95. Students who plan to enter the research field or continue their training in sociology or anthropology at the graduate school level, are advised to elect Statistics 50 in the Junior or Senior year and to begin to develop a reading knowledge of French and German. Students majoring in this department must maintain a minimum quality point average of 2.0 (C grade) or better in Sociology and Anthropology courses.

Social Work

The American Association of Schools of Social Work indicates that the pre-professional subjects most closely related to professional work in this field are economics, political science, psychology, and sociology. The Association recommends that prospective students of social work or social administration take not fewer than 12 semester hours in one of these subjects while taking less in others. It also recognizes the value of courses in biology, history, English, as well as other subjects contributing to a broad cultural background for the student.

SOCIOLOGY

1. (I) (II) Introduction to Sociology

A study of the social order, and of the individual considered as a member of his various groups. 3 class hours. Credit, 3. The Department.

2. (I) (II) Principles of Sociology

The theoretical development of major sociological concepts with emphasis on American sociologists. Analysis of monographs utilizing the sociological frame of references for selected areas. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. O'Rourke.

50. (I) (II) Elementary Statistics

An introduction to principles and techniques with special reference to application in Sociology. Credit, 3. Mr. Park.

51. (I) Urban Sociology

A study of urban American social conditions with reference to population, ecology, health, and the classically defined institutional complexes and their problems of adjustment. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mrs. Golden.

52. Rural and Peasant Societies

A study of rural and peasant societies from the standpoint of their population and institutions, their emerging needs, and their relation to mass society. Credit, 3. Prerequisite, Soc. 1. Mr. Lopreato.

54. (II) Industrial Sociology

The role, status, and function of the worker in the industrial community. A consideration of changing technology and the adjustment made in the industrial community. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Korson.

56. (II) Race Relations

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration of similar problems in Africa and Asia. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Gordon.

57. (I) (II) The Family

The development of the customs of courtship and marriage of the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. King, Mr. Korson.

58. Social Interaction

A study of the processes leading to the socialization of the group member, with emphasis on role properties, play, control models, power definitions and allocation. Prerequisites, Soc. 1 and 2. 3 class hours. Credit, 3. Mr. Lopreato.

59. (I) Social Stratification

The factors which make for institutionalized inequality in social life. A consideration of castes and classes in American society. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Lopreato, Miss Sussmann.

61. (I) Population Problems

An analytical study of population composition, focusing upon the causes and consequences of changes in the basic demographic variables: fertility, mortality, and migration. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Wilkinson.

70. Social Structure of India

The origins, distribution, and cultural traits of the major groups in India. Special attention given to marriage, family, caste patterns, and positions in the economic and political system. 3 class hours. Credit, 3. Mr. Driver.

72. (II) Social Change

A consideration of changes arising from culture contact, social reform, and technical inventions. Planned and unplanned change, particularly with respect to underdeveloped countries. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. King.

75. (I) Social Problems

The distribution and interrelationships among types of deviance and disorganization: crime, mental disorders, addiction, suicide, family tensions. Theories of causation; research projects; field trips. Prerequisite, Sociology 1. Credit, 3 Mr. Stanfield.

78. (II) Criminology

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Driver, Mr. Stanfield, Miss Kay.

82. (I) (II) Sociological Theory

An examination of contributions of European and American writers who have concerned themselves with theories of the origin, growth, and development of human social organization. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Mr. Manfredi.

92. (II) Introduction to Social Welfare

Methods of caring for adult and child dependents and defectives. Public and private agency administration and techniques. Federal, state, and local community programs. Prerequisite, Sociology 1. 3 class hours. Credit, 3. Miss Kay.

95. (I) (II) 96. (II) Seminar, Research Methods

A consideration of research methods and techniques employed in sociology. Each student is required to design and complete a research project of limited scope. Prerequisite, Sociology 1. Credit, 3. Mr. Park.

ANTHROPOLOGY

3. (I) (II) Introductory Anthropology

An introduction to the fields of anthropology: human evolution and race; prehistory; variations among societies in kinship, economic, political and religious organizations. 3 class hours. Credit, 3. Mr. Fortier, Mr. Fraser, Mr. Bick.

60. World Archaeology

An introduction to the history, methods and theory of archaeology, with an outline of the main characteristics of the prehistoric record, emphasizing social aspects and evolutionary significance. Prerequisite, Anthropology 3. 2 class hours, 1 2-hour lab. Credit, 3. Mr. Bick.

64. (II) Problems in Anthropology

Examination of selected problems in social structure: economic organization, kinship systems, political forms and religion of non-literate peoples. Prerequisite, Anthropology 3 or permission of instructor. 3 class hours. Credit, 3. Mr. Fraser.

65. (I) Profiles in Culture

The study of selected societies of Africa, Oceania, the Americas and Asia. Problems of comparing societies, especially with regard to their environmental contexts. Prerequisite, Anthropology 3. 3 class hours. Credit, 3. Mr. Fraser.

66. (II) The Individual and Society

Selected approaches to the interrelations of individual behavior and social patterns, with consideration of data on "Western" and "non-Western" societies. Prerequisite, Anthropology 3 or permission of instructor. 3 class hours. Credit, 3. Mr. Fortier.

67. (I) Cultures of Africa

A limited consideration of the history, physical types, social organization and culture of Africa south of the Sahara with special consideration of several diverse cultures. Prerequisite, Anthropology 3 or permission of instructor. 3 class hours. Credit, 3. Mr. Bick.

73. Cultures of Southeast Asia

An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role in the development of modern Southeast Asian states. Prerequisite, Anthropology 3 or permission of instructor. Credit, 3. Mr. Fraser.

74. Cultures of the Far East

A survey of the culture-history and ethnography of representative peoples of East Asia; peasant sub-cultures of traditional and contemporary China, Japan, and Korea. Prerequisite, Anthropology 3 or permission of instructor. Credit, 3. Mr. Fortier.

76. Cultures of Latin America

This course will analyze the prehistoric, colonial and contemporary cultures of Latin America, focusing on the Indian, European and Negro people of this continent, and how they have related to each other over the past three centuries. Prerequisite, Anthropology 3, or permission of instructor. Credit, 3. Mr. Bick.

79. Cultural Dynamics and Applied Anthropology

A consideration of theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development. Prerequisite, Anthropology 3, Recommended, Anthropology 4. Credit, 3. Mr. Fraser.

SPEECH

Head of Department: Professor Arthur E. Niedeck. Associate Professors Hegarty, Larson; Assistant Professors Abramson, Catalano, Harper, Mahnken, Peirce, Savereid; Misses Hanifan, Labelle, Messrs. Biddle, Price, Sarno, Stromgren, Wells.

Speech

An undergraduate major in speech may be earned by completing thirty semester hours of course work in the department. Psychology 1 should be elected as a basic requirement. The student must select an area of concentration in (1) Rhetoric and Public Address, (2) Theatre, (3) Radio and Television, (4) Speech Education, (5) Speech and Hearing Therapy. Students concentrating in Speech and Hearing Therapy may fulfill all the certification requirements of the American Speech and Hearing Association and the Massachusetts State Department of Education. Students interested in preparation as public school therapists should plan to minor in the School of Education. For those interested in work in a rehabilitation or hospital setting, a minor in psychology should be planned.

3. (I) and (II) Oral Communication

Introductory instruction and practice in oral self-expression: literary interpretation and public speaking. 2 class hours. Credit, 2. The Department.

15. (I) (II) Introduction to Theatre

An introduction to the art of the theatre: A survey of its aesthetics, elements, forms and contributing artists; its influences and place in the culture of our society. 3 class hours, 10 laboratory hours per semester by arrangement. Credit, 3. Mr. Catalano.

35. (I) (II) Fundamentals of Play Production

A study of the methodology and techniques of play production through lectures, demonstrations and practical laboratory work. The responsibilities and contributions of all participating artists will be examined in detail through an intensive study of every aspect of production from script to stage. 3 class hours. Credit, 3. Mr. Niedeck.

40. (I) (II) Fundamentals of Stagecraft

The study of the fundamental principles of construction, rigging, shifting and painting of scenery through lectures, demonstrations and practical laboratory work. Prerequisite, Speech 15. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Wells.

41. (I) (II) Fundamentals of Stage Lighting

The study of aesthetics, fundamentals and facets of stage lighting through lectures, demonstrations and practical laboratory work. Prerequisite, Speech 15. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Wells.

42. (I) (II) Principles of Stage Makeup

The study of the principles of stage makeup through a lecture-demonstration-laboratory practicum. Prerequisite, Speech 15. 1 2-hour laboratory class. Credit, 1. The Department.

50. (I) and (II) Voice and Diction and Oral Interpretation

Training and drill in the correct production of speech, practice in the fundamentals of vocal interpretation of literature. 3 class hours. Credit, 3. Miss Abramson.

51. (I) and (II) Public Speaking

The study and application of principles governing the composition and delivery of public speeches. 3 class hours. Credit, 3. The Department.

52. (II) Discussion

The study of the principles of group discussion and their application to major contemporary problems. 3 class hours. Credit, 3. Mr. Savereid.

53. (I) Argumentation and Debate

The study and application of reasoning and evidence as it is used in public deliberation. Prerequisite, Speech 91, or permission of instructor. 3 class hours. Credit, 3. Mr. Biddle.

54. (II) Persuasion

Advanced study and practice in appeals to beliefs and action through extemporaneous speech. Prerequisite, Speech 91, or permission of instructor. 3 class hours. Credit, 3. Mr. Price.

55. (I) History of Rhetorical Theory

A study of rhetorical theory from Plato and Aristotle to the present with particular emphasis on the Greeks and Romans. Prerequisite, Speech 50, or permission of instructor. 3 class hours. Credit, 3. The Department.

57. (I) American Public Address

Reading and analysis of speeches taken from the American political platform, academic platform, pulpit, courtroom, and ceremonial platform. Lectures, discussions, written reports, and listening to contemporary addresses over the radio or on tape. Prerequisite, Junior standing, or permission of instructor. 3 class hours. Credit, 3. The Department.

58. (II) Advanced Rhetorical Composition

An intensive study of the departments of invention, disposition, and style. Practice in the application of principles studied in classical and modern treatises by the preparation and revision of outlines and manuscripts for speeches. Prerequisite, Speech 50. 3 class hours. Credit, 3. The Department.

61. (I) (II) Broadcasting in America

An intensive analysis of broadcasting in America emphasizing its evolution, economic structure, nature of the programming, and its impact on the American society. 3 class hours. Credit, 3. Mr. Harper.

62. (II) Radio Production

A laboratory course which emphasizes practical experience in all aspects of radio production and includes all the basic formats of radio programs. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Sarno.

63. (I) Televsion Production-Direction

A laboratory course emphasizing TV studio procedure and technique. Practical experience is provided in all studio crew assignments other than those involving electronics. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Harper.

64. (II) Advanced Television Production-Direction

An advanced laboratory course which builds on the basic skills and techniques developed in the basic production course. Prerequisite, Speech 63. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Harper.

71. (II) Introduction to Scene Design

The study of the aesthetics, fundamentals and facets of scene design through lectures, class projects and practical laboratory work. Prerequisite, Speech 40 and 41, or special consent of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. The Department.

73. (I) Fundamentals of Acting Techniques

The study of the principal techniques of the art of acting with emphasis on individual development; the examination of the basic tenets of this art through practical application and exercises. Prerequisite, Speech 15. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Catalano.

74. (II) Fundamental Theories of Acting

The study of the principal theories of acting; the investigation and application of the principal historical and contemporary theories of character analysis, development and performance. Prerequisite, Speech 73. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Catalano.

75. (I) Fundamental Techniques of Play Directing

The study of the fundamental techniques of the art of play directing; the Director's media, the arrangement of the stage picture and production procedures. Prerequisite, Speech 73. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Mahnken.

76. (II) Fundamental Theories of Play Directing

The study of the principal theories of play direction with emphasis on the Director as an interpretative artist; a study of the audience and the play in terms of the nature of the dramatic and the theatrical. Prerequisite, Speech 75. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Mahnken.

77. (I) History of Theatre of Western Civilization I

The study of the History of the Theatre of Western Civilization from its beginnings to 1642; an investigation of the Classical, Medieval and Renaissance Theatres with emphasis on the origins and development of Drama, Spectacle, Theatre Production and Theatre Architecture. 3 class hours. Credit, 3. The Department.

78. (II) History of Theatre of Western Civilization II

A continuation of Speech 77 with emphasis on the 18th and 19th centuries, the Continental, English, American, and Modern Theatres. 3 class hours. Credit, 3. The Department.

81. (I) (II) Phonetics

A scientific study of the sounds of English; descriptive analysis of individual vowels and consonants. Study of the International Phonetic Alphabet; training in auditory discrimination. 3 class hours. Credit, 3. Misses Hanifan, Labelle.

82. (I) (II) Introduction to Clinical Practice

Training in basic diagnostic and therapeutic techniques for various speech handicaps; emphasis on articulation defects, delayed speech and stuttering. Supervised practice required. Prerequisites, Speech 81, 85. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Hanifan.

83. (I) Anatomy and Physiology of the Speech and Hearing Mechanism

A study of the anatomy and physiology of the speech and hearing mechanism; consideration of phonation, resonance, articulation and audition. Prerequisites, Zoology 37, 38. 3 class hours. Credit, 3. Miss Hegarty.

84. (II) Audiology

A study of the symptoms and causes of hearing loss; special attention to diagnostic test procedures. Supervised practice in audiometric testing. Observation; field trips. Prerequisite, Speech 85. 3 class hours. Credit, 3. Miss Hegarty.

85. (II) Introduction to Speech Pathology

A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy. Observation; field trips. Prerequisite, Psychology 1. 3 class hours. Credit, 3. Miss Hegarty.

86. (II) Rehabilitation of the Acoustically Handicapped

Training in the techniques of speech therapy, auditory training, and speech reading for children and adults with hearing impairments. Laboratory practice under supervision. Prerequisite, Speech 84. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Hanifan.

88. (II) Advanced Clinical Practice

Advanced training in clinical practice under supervision; special consideration of organic speech disorders. Opportunity for supervised clinical practice at Lemuel Shattuck Hospital. Prerequisite, Speech 82. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Hegarty.

96. (II) Seminar in Speech Pathology

Individual student reports on selected topics in the field of speech pathology. Prerequisite, Speech 85. 3 class hours. Credit, 3. Miss Hegarty.

97. (I) (98.) (II) Independent Study and Research

For qualified seniors, independent study and research on selected problems in the various major areas of study. Credit, 1-3.

STATISTICS

Professor Gail B. Oakland; Assistant Professor Wolock

The curriculum in statistics is designed to teach the student to observe carefully and correctly, to treat his data honestly and dispassionately and to reason objectively from a set of conditions to their logical conclusions. It emphasizes the logical relation of the analytical techniques taught to the main categories of scientific method: observation and classification of data, induction and deduction.

There is no undergraduate major in statistics. The curriculum is intended for those who wish to prepare themselves for graduate work in statistics and for those who require statistics as a basic preparation for their own subject-matter discipline. Cognate courses are needed to supply a basis for mature thinking. The statistical specialist should choose, according to his interests, cognate courses from such fields as: animal and plant breeding, biology, computer science, econometrics, engineering, genetics, mathematics, market research, psychology, and sociology. Such students who expect to specialize in statistics should take Statistics 55 and 56 no later than their junior year.

Statistics leans heavily on mathematics and most of the prerequisites of the advanced statistical courses will come from: calculus (Mathematics 26), probability (Mathematics 63), linear algebra (Mathematics 68), and differential equations (Mathematics 92). Statistics 61, 62, 71, 72, 81, 82, and 92 are available for students who have the appropriate prerequisites. Two pairs of the above courses: Statistics 61, 62 (Design of Experiments) and Statistics 81, 82 (Multivariate Analysis) are given as courses complementary to each other. The lower numbers 61 and 81 designate courses on methodology while the higher numbers (62 and 82) designate courses on theory. For those who wish to use statistics primarily as a tool, Statistics 21, 51, 61, 71, 72, and 81 provide basic grounding. For those who have the calculus prerequisites, Statistics 55 and 56 are recommended in place of 21 and 51.

The Statistical Laboratory located in Clark Hall is open to students and staff wishing to use its facilities. Students wishing to use the calculating machines will be instructed in their proper use. The laboratory is supervised at all times. A wide range of statistical and mathematical tables are available and may be used in the laboratory.

21. (I) (II) Elementary Statistics

The nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation; time series. 3 class hours. Credit, 3.

51. (II) Elementary Statistics

The analysis of variance; the design of experiments; sample surveys, multiple regression, non-parametric tests. Prerequisite, Statistics 21. 3 class hours. Credit, 3.

55. (I) Introductory Statistics

Descriptive statistics; mathematical properties of distribution functions; statistical inference; relationships between variables. Prerequisite, Mathematics 26. 3 class hours. Credit, 3.

56. (II) Introductory Statistics

The analysis of variance; the design of experiments; acceptance sampling; non-parametric inference. Prerequisite, Statistics 55. 3 class hours. Credit, 3.

61. (I) Design of Experiments (Methods)

Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields. Prerequisite, Statistics 21 or 55. 3 class hours. Credit, 3.

62. (II) Design of Experiments (Theory)

Conceptual basis of experimental designs, especially randomized blocks, latin squares, factorial and sequential, incomplete blocks, and experiments with attributes. Prerequisite, Statistics 56. 3 class hours. Credit, 3.

71. (I) Survey Sampling

The theory and practice of sampling; optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, the problem of non-response. Prerequisite, Statistics 21 or 55. 3 class hours. Credit, 3.

72. (I) Sampling Theory and Methods

Problems and methods of samplings, production and quality control, acceptance sampling, OC and ASN curves, types and properties of estimators. Prerequisite, Statistics 21 or 55. 3 class hours. Credit, 3.

81. (I) Multivariate Analysis (Methods)

Applications of the theory in Statistics 82 to actual problems; it may involve research studies by the students, critiques of published research, or analysis of other bodies of data. Prerequisite, Statistics 51 or 56. 3 class hours. Credit, 3.

82. (II) Multivariate Analysis (Theory)

Correlation and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions. Prerequisites, Statistics 56, Mathematics 68. 3 class hours. Credit, 3.

92. (II) Frequency Distribution

Basic probability. frequency functions, transformation of variates, generating functions, normal and related distributions, binomial, multinomial, hypergeometric, poisson, exponential, logarithmic and other distributions including Pearson's system. Prerequisites, Statistics 56 and Mathematics 92 (or concurrently). 3 class hours. Credit, 3.

ZOOLOGY

Head of Department: Professor Donald Fairbairn. Professor Emeritus Traver; Professors Anderson, Bartlett, Honigberg, Rauch, Snedecor; Associate Professors Harvey, Nutting, J. L. Roberts, Rollason, Swenson; Assistant Professors Andrews, Moner, L. S. Roberts, Snyder; Mrs. White, Mr. Sargent.

Major aims served by courses of instruction in zoology are:

(1) To present biological principles insofar as these contribute to a liberal education (Zoology 1, 25, 35),

(2) To satisfy the need for specialized training of students majoring in other departments or schools (Zoology 37, 38, 54), and

(3) To provide the fundamentals of professional training for Zoologists, and also for those who plan to qualify professionally in medicine, dentistry, and veterinary science.

Students electing zoology as their major subject must complete the following courses or their equivalents: Mathematics 9, 10; Physics 3, 4; Botany 1; Zoology 1, 50, 53, 70, 71, 72, 83; Chemistry 3, 4, 32, 51, 52, 53, 54 (or, less preferably, Chemistry 1, 2, 27, 51, 52, 53, 54) and

four additional courses in the sciences or mathematics of which at least one must be in zoology.

The following courses are required of zoology majors planning to teach in high schools: Zoology 1, 35, 53, 70, and four electives; Botany 1, 26; Chemistry 1, 2, 33; Physics 3, 4; Mathematics 7, 9; Education 51 (junior year); concentrated semester block, Education 52, 85, 88 (senior year); Psychology 56; additional science credits, if desired, recommended from: Microbiology 31, Geology 28, Wildlife Management 27, Botany 81, Entomology 26, 79, 90, Chemistry 79.

ZOOLOGY

1. (I) (II) Introductory Zoology

Principles of biology with special reference to the cell and its metabolism and to the anatomy, physiology and evolution of the major groups of the animal kingdom. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Rollason and staff.

25. (I) Survey of the Animal Kingdom

Emphasis on adaptation, symbiosis, ecology, and evolution, and a consideration of major animal phyla which best illustrate these topics. Several field trips. Prerequisite, Zoology 1. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Nutting.

35. (I) (II) Vertebrate Physiology

Includes circulation, respiration, digestion, metabolism, excretion, chemical and nervous coordination, muscular activity, and reproduction. Prerequisite, Zoology 1. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Snedecor.

37. (I) 38. (II) Anatomy and Physiology

Designed for students in the School of Nursing. Prerequisites Zoology 1; Chemistry 1, 2; 37 prerequisite for 38; credit only for full year course. 3 class hours, 1 3-hour laboratory. Credit 4 per semester. Mrs. White.

50. (I) Histology of the Vertebrates

Study of the cell, tissues, microscopic anatomy with emphasis on the mammal, and the elements of microtechnique. Prerequisite, Zoology 1. 2 class hours. 1 3-hour laboratory. Credit 3. Mr. Rollason.

52. (II) Genetics Laboratory

Experience in the techniques of transmission genetics. Prerequisite, Zoology 53. 1 3-hour laboratory. Credit 1. Mr. Rauch.

53. (I) Principles of Genetics

Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics and evolution. Prerequisite, Zoology 1, Chemistry 2 or 4. 3 class hours. Credit, 3. Mr. Rauch.

54. (II) Natural History

Designed to orient the student to features of sky, climate, and terrain, of importance to the teaching naturalist. Methods of identification, collecting data, etc. Prerequisites, Botany 1; Zoology 1. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Nutting.

58. (II) Human Genetics

The principles of genetics with reference to its implications and applications to man. Not open to natural science or agriculture majors. Prerequisite Zoology 1. 3 class hours. Credits, 3.

64. (II) Biology of Protozoa (1964-65)

Morphology and physiology of Protozoa, with emphasis on the contributions made to the basic problems of biology through the study of these organisms. Given in alternate years. Prerequisites, Zoology 1 and permission of instructor. 1 class hour, 1 2-hour and 1 3-hour laboratory periods. Credit, 3. Mr. Honigberg.

69. (I) General Parasitology

Morphology, life cycles, and physiology of primarily protozoan and helminth parasites, with emphasis on broad aspects of parasitism. Prerequisites, Introductory College Zoology and Chemistry. 2 hour lectures, 2 2-hour laboratory periods. Credit, 4. Mr. Honigberg.

70. (II) Invertebrate Zoology

Survey of the phyla of invertebrate animals from evolutionary ecological and phylogentic aspects. For each phylum, representatives of the principal classes are studied. Prerequisite, Zoology 1. 1 class hour, 2 3-hour laboratory periods. Credit, 3. Mr. Nutting.

71. (I) Comparative Vertebrate Anatomy

Structure and phylogeny of the vertebrates. Laboratory work will illustrate evolutionary trends and specializations and provide experience in dissection. Prerequisite, Zoology 1. 2 class hours. 1 3-hour laboratory. Credit 3. Mr. Snyder.

72. (II) Embryology

Description of the development of amphibian, bird, and mammal. Introduction to experimental embryology stressing biochemical studies of ontogeny. Prerequisite, Zoology 71. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Harvey.

74. (II) Limnology (1965-66)

Study of inland waters including geological, physical, chemical and biological aspects. Given in alternate years. Prerequisites, Botany 1; Zoology 1; Chemistry 1, 2 and permission of instructor. 2 class hours, 2 3-hour laboratories or field trips. Credit, 4. Mr. Andrews, in cooperation with the departments of Botany, Entomology, Public Health, Geology, and Zoology.

78. (II) Population Genetics

Principles of population genetics emphasizing this approach to the study of species formation. Prerequisites, Zoology 53 and permission of the instructor. 3 class hours. Credit, 3.

80. (II) Ornithology

Avian biology emphasizing the correlation of structure function and behavior; identification. Prerequisite, Zoology 1. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Bartlett, Mr. Sargent.

81. (I) Vertebrate Zoology

History, relationships, patterns of distribution, with major emphasis on the fishes. Prerequisite Zoology 1. 1 class hour, 2 2-hour laboratories, field trips. Mr. Andrews.

82. (II) Mammalogy

Evolution, distribution, classification, and ecology of mammals. Laboratory will include field trips, preparation of study material, and identification of local fauna. Enrollment limited to 15. Prerequisites, Zoology 1 (Zoology 71 recommended) and permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Snyder.

83. (I) General and Cellular Physiology

The fundamental processes common to all cells. Emphasis on the physics and chemistry of single cells. Prerequisites, 1 year of Biology; Organic Chemistry. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Swenson, Mr. Moner.

84. (II) Comparative Physiology

Physiological principles involved with the evolution of the adaptations in animals to their environments. Prerequisite, Zoology 83, or the consent of the instructor. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Roberts.

86. (II) Fishery Biology

Properties of fish populations including reproduction, growth demography; conditions in the aquatic environment influencing fish populations. Prerequisite Zoology 81. 2 class hours, 1 3-hour laboratory. Mr. Andrews.

87. (I) Endocrinology

The importance of the endocrines in their control over normal functions (growth, metabolism, reproduction, etc.), in a variety of animals. Prerequisite, Zoology 1. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Snedecor.

97. (I) 98. (II) Special Problems in Zoology

Qualified students who have met departmental requirements for specialization in the field of zoology may arrange for work on a special problem in zoology. Credit, 1-3 per semester.

Invertebrate Zoology, Marine Biological Laboratory, Woods Hole, Massachusetts. Credit, 3.

Invertebrate Embryology, Marine Biological Laboratory, Woods Hole, Massachusetts. Credit, 3.

INTERDEPARTMENTAL COURSES

Comparative Literature 71. (I) The Enlightenment

Characteristic themes, ideas and attitudes in 18th Century European Literature. The course will focus on major representatives of the Age of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany. Prerequisites, proficiency in French or German. 3 class hours. Credit, 3.

Comparative Literature 91. (I) Anglo-German Literary Relationships since 1750

Study of subjects and problems common to English and German literature since the middle of the eighteenth century with some attention to German-American literary relationships. By permission may be counted for major credit in English and German. 3 class hours. Credit, 3. Mr. Heller, Mr. Page.

Linguistics 93. (I) Linguistics

A basic course combining comprehensive treatment of the field with special attention to recent contributions, particularly in structural linguistics, to the study of language and literature. By permission may be counted for major credit in English, German, and Romance Languages. Prerequisites, English 25, 26. 3 class hours. Credit, 3.

Social Science 60. (II) Africa, South of the Sahara

An introductory study of recent political, economic, and social developments in the principal countries of Africa, south of the Sahara. By permission may be counted for major credit in government and sociology. Prerequisites, at least two semester courses in one or more of the following fields: economics, government, sociology. 3 class hours. Credit, 3.

Social Science 69. (I) India and South Asia

An introductory study of recent political, economic, and social developments in India and the countries of South and Southeast Asia. By permission may be counted for major credit in government and sociology. Prerequisites, at least two semester courses in one or more of the following fields: economics, government, sociology. 3 class hours. Credit, 3. Mr. Driver.

History of Science 60. (II) Survey

A study of the development of a few major scientific concepts. 3 class hours. Credit, 3.

Computer Science 21. (I) (II) Introduction to Automatic Computation

An introduction to the programming of digital computers. Topics included are basic programming systems, compiler languages, and the logic of programming and compilation. Prerequisite, Mathematics 2 or 4. 1 class hour. Credit, 1. Mr. Rowell.

Computer Science 51. (I) (II) Digital Computer Programming and Applied Numerical Techniques

Designed primarily for the physical science and engineering majors; includes complete coverage of FORTRAN programming and selected topics in numerical methods. Prerequisite, intermediate algebra; a knowledge of calculus is helpful but not prerequisite. 2 1-hour lectures, 1 3-hour laboratory period. Credit, 3.

ORIENTAL LANGUAGES

Elementary Chinese 1. (I) 2. (II) Modern Chinese

For those with no previous training in Chinese language. Grammar, reading and writing characters, practice in reading, composition and oral use of the language. Prerequisites, completion of foreign language proficiency. 3 class hours. Credit, 3. Miss Kopetsky.

Elementary Hindi 1. (I) 2. (II)

For those who have had no previous training in Hindi. Intensive practice in the language skills. Prerequisites, completion of foreign language proficiency. 3 class hours. Credit, 3.

Elementary Japanese 1. (I) 2. (II)

For those who have had no previous training in Japanese. Intensive practice in the language skills. Prerequisites, completion of foreign language proficiency. 3 class hours. Credit, 3.

COLLEGE OF AGRICULTURE

ARLESS A. SPIELMAN, *Dean*

The College of Agriculture offers a broad general education with scientific and technical training in a specialized area. Upon the completion of the requirements for graduation, the student will have devoted about one-quarter of his time to pure science, one-quarter to social and humanistic studies, and about one-half to applied science and technology. A broad choice of electives within the required courses of each curriculum gives the student the opportunity to prepare for a career in research, industry, business, education, conservation, services, or farming. Each department of the school has specific requirements for graduation which are included in the descriptive matter under the name of the department. During the first semester of the freshman year, students interested in teaching vocational agriculture, extension work, or specializing in research work, should consult with the head of the department in which they plan to major. Students may major in: Agricultural and Food Economics, Agricultural Engineering, Animal Sciences, Entomology, Food Science and Technology, Forestry, Landscape Architecture, Plant and Soil Science, Restaurant and Hotel Management, Pre-Veterinary, or Wildlife and Fisheries Biology.

Curricula in Agriculture

Students majoring in Agricultural Engineering follow the program outlined on Page 129. All other majors take the following curriculum during the first two years.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3*	2	Speech 3*	2
Mathematics 1, 7 or 9[1]	3	Mathematics 2, 9 or 10[1]	3
Chemistry 1, General	3	Chemistry 2, General	3
Botany 1, General	3	Zoology 1, General	3
(Military or Air Science 11 (men)	1)	Elective	3
Agricultural and Food Economics 1	3	(Military or Air Science 12 (men)	1)
Physical Education 1a, b	0	Physical Education 2a, b	0

[1] Candidates for the Bachelor of Vocational Agriculture degree must take Mathematics 01 followed by an appropriate second course.

* May be taken either semester or during a later year.

A foreign language may be substituted for the Agricultural and Food Economics — elective sequence.

SOPHOMORE YEAR

English 25 and 26 (Humane Letters), two courses from the Social Sciences, two courses from Mathematics or the Natural Sciences, Physical Education and electives. The Sophomore year in Landscape Architecture is described separately.

AGRICULTURAL AND FOOD ECONOMICS

Head: Professor John Blackmore. Professor Leed; Associate Professors Fitzpatrick, Foster, Russell, Storey; Assistant Professors Jarvesoo, Lee, Marion.

The curriculum in Agricultural and Food Economics is designed (1) to prepare students for employment in executive positions with firms in agriculture and the food industry or for administrative positions with related government agencies and (2) to give the essential undergraduate preparation for a career as an economist, working in research, teaching, or consulting work in agriculture or the food industry. The course of study, which leads to the degree of Bachelor of Science, combines training in relevant technical agricultural subjects with courses in business maagement and economics. The resources of the College of Arts and Sciences and of the School of Business are used in addition to those of the College of Agriculture in order to provide a body of course work which gives the student thorough technical training within the framework of a liberal college education. Students with a primary interest in Food Economics will elect Animal Science 58, Plant Science 73 and 74, and Food Technology 75. Students with a primary interest in the Economics of Agriculture will elect courses totaling 12 credit hours of technical agriculture suitable to their professional interests. All majors will take nine credits in mathematics; Economics 25 and 73; Geography 55; Accounting 25; General Business 71; Statistics 79 and 80; and Agricultural and Food Economics 26, 58, 71, 75, either 55 or 65, and either 68 or 78. At least 24 semester credits in electives are available for courses to be selected in accordance with the particular professional interests of the student. A special list of suggested electives is available for students with an interest in regional planning and development.

1. (I) Food and Natural Resources

The world's agricultural and food industries; geography and economics of food and fiber production; problems in U.S. food policy; world, resource and food problems. 3 class hours. Credit, 3. Mr. Blackmore.

26. (II) Elements of Agricultural Economics

Application of basic economic analysis methods to principal problems of the farm and agricultural industry. Elementary applications of macro theory and theory of the farm. 3 class hours. Credit, 3. Mr. Fitzpatrick.

55. (I) Principles of Agricultural Marketing

The economic principles governing the marketing of agricultural and food products; structure of agricultural markets. Monopoly and imperfect competition. Government in marketing. 3 class hours. Credit, 3. Mr. Fitzpatrick.

58. (II) Agricultural Policy

Concepts of policy, economic foundations of policy problems, the policy making process, and policy considerations for producers, consumers and taxpayers; foreign agricultural policy. 3 lecture hours. Credit, 3. Mr. Bird.

65. (I) Food Merchandising

The principles of merchandising food products. Effects of store layout, product location, product mix, methods of display, turnover, pricing, ordering, inventory control, upon sales and profits. 3 class hours. Credit, 3. Mr. Marion.

68. (II) Food Distribution Economics

A critical analysis of the food industry, factors affecting sales, costs, profits. Application of economic principles to financing, site selection, and store management. 3 class hours. Credit, 3. Mr. Leed.

71. (I) Price Theory and Analysis

Elements of food and agricultural price making; demand and supply theory and methods of price analysis and forecasting; introduction to econometrics. 3 class hours. Credit, 3. Staff.

72. (II) International Agricultural Policy

Economic development of low income economies. Emphasis on agricultural sector. Relations of agriculture to national economy. Approaches to agricultural improvement. Analysis of development programs. 3 class hours. Credit, 3. Mr. Foster, Mr. Blackmore.

75. (I) Agricultural Management Economics

Basic decision making principles, management tools, analysis, management philosophy, needed for successful management of commercial farms and other agricultural firms. 3 class hours. Credit, 3. Mr. Lee.

78. (II) Resource and Conservation Economics

Economic and institutional factors affecting land and water use. Land use planning, elements of conservation economics, recreation economics, water and watershed management. 3 class hours. Credit, 3. Mr. Foster, Mr. Blackmore.

97. (I) 98. (II) Special Problems in Agricultural and Food Economics

Credits, 2-3 Staff.

AGRICULTURAL ENGINEERING

Head of Department: Professor R. W. Kleis. Professors Clayton, Fitzgerald; Associate Professors C. Johnson, Norton, Whitney, Zahradnik; Assistant Professors Pira, Collins, Light, E. Johnson; Mr. Fletcher.

Agricultural Engineering is concerned with the application of scientific engineering principles to agricultural industries. This professional field includes engineering activities related to the design, development and use of mechanical and electrical equipment; structures; and soil and water control systems for the production, processing and preservation of agricultural products and the improvement of rural living. Agricultural engineers are employed by a variety of agricultural industries and organizations for research, development, teaching, and promotional

activities. The program is designed to provide sound training for the agricultural engineering profession. The student majoring in this field will take his freshman and sophomore work at the University and then, under a cooperative agreement, complete his Bachelor of Science program at the University of Maine.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Math. 6, Diff. Calculus	4
Math. 5, Analy. Geom.	4	Chem. 2 or 4, General	3
Chem. 1, General	3	Mech. Engin. 2, Drawing	3
Mech. Engin. 1, Drawing	2	Physics 6, General	3
Physics 5, General	3	(Military or Air Science 12	1)
(Military or Air Science 11	1)	Physical Ed. 2a, b*	2
Physical Ed. 1a, b*	2		

* Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Humane Letters	3	English 26, Humane Letters	3
Math. 31, Integ. Calculus	4	Math. 32, Diff. Equations	4
Physics 7, General	4	Psych. 1 or Soc. 25	3
Civil Engin. 31, Surveying	3	Agric. Elective	3
Mech. Engin. 35, Engin. Mat'l.	4	C. E. 34 Statics	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

JUNIOR AND SENIOR YEARS

At the University of Maine

(Consult Agricultural Engineering Department for details.)

51. (I) House Planning

Space arrangement, construction materials, construction problems and discussions, utilities, financing, maintenance and remodeling. Particular emphasis on planning and evaluation procedures and factors. 1 class hour. 2 2-hour laboratory periods. Credit, 3. Mr. C. Johnson.

53. (I) Food Service Facilities Planning

Space organization and equipment layouts; discussions and planning relative to facilities, utilities and materials handling. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. E. Johnson.

55. (I) Shop Practice

Instruction and practice in use of tools and power equipment; carpentry, welding, sheet metal forming, and concrete work; materials, skills, practices and safety consideration. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Pira.

72. (II) Drainage and Irrigation

The engineering factors of drainage and irrigation; study of various system types and design of systems; problems of flow and run-off. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. E. Johnson.

75. (I) Structures and Related Equipment

Fundamental aspects of planning modern farm structures with emphasis on functional design, environmental control and integration of mechanical equipment. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Light.

76. (II) Mechanization in Crop Production

Principles of operation, maintenance, and selection of farm tractors and field machinery; also of irrigation and drainage systems and equipment. Emphasis on management practices and discussions. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Whitney.

81 (I) Elements of Food Process Engineering I

Study of fundamental principles involved in the application of unit operations to food processing including selection, management and operation of processing units and instrumentation. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Zahradnik.

82. (II) Elements of Food Process Engineering II

Continuation of Agricultural Engineering 81; a study of the processing of raw materials, including mixing, heating, cooling, evaporating, distilling, dehydration and drying. Prerequisite, Agricultural Engineering 81. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Zahradnik.

90. (Summer) Instrumentation

Study of Instrumentation applied to research; covering recorders, indicators, controllers and transducers in general. Special emphasis on applications and limitations. Prerequisite, Physics 4 or equivalent. 2 class hours, 1 2-hour laboratory period. Credit, 3. Instructor Mr. Whitney.

THE ANIMAL SCIENCES

Animal Science: Head of Department: D. J. Hankinson. Professors W. Black, Foley; Associate Professor D. Black; Assistant Professors Buck, Lyford.

Poultry Science: Head of Department: Thomas W. Fox. Professors Mellen, Smyth; Associate Professor Anderson; Assistant Professor Grover; Mr. Denison.

The curriculum in the animal sciences is designed to provide the student with fundamental training and knowledge in the comparative nutrition, physiology, breeding, selection and management of various classes of livestock and to understand the role of animal production in the national and world economy. To accomplish this objective, all students are expected to take Animal Science 21, 50, 58, 61, 64, 67, 68, 73, 74; Zoology 35 and 53; Bacteriology 21; and Veterinary Science 72. The curriculum provides for an important degree of flexibility depending upon the students' interests and abilities. Options emphasizing commercial animal production are supported by electives in agricultural economics, agricultural engineering, and business administration. Students interested in graduate work in such specialized areas of the animal sciences as nutrition, physiology or genetics should elect programs with special emphasis on the basic sciences. Suggested supporting courses and program organization for the various fields of specialization are available from the advisers. Students in need of practical experience will be required to complete one summer of placement employment (in

production agriculture, industry, or research as determined in consultation) before graduation.

THE ANIMAL SCIENCES

21. (I) Introductory Animal Science

Modern Animal and Poultry Science and its role in national and world economics. 3 class hours. Credit, 3. Staff.

50. (II) Animal Physiology

A comparative study of the physiology of mammals and birds, with emphasis on those aspects most pertinent to animal science. Prerequisite, Zoology 35. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. D. Black.

56. (II) Livestock Production

Beef, sheep and swine production in New England and the United States. Field trips cost approximately $5.00. 3 class hours, 1 2-hour laboratory period. Credit, 4. Staff.

58. (II) Animal Products

Preparation, processing, packaging and marketing of animal products. Field trips cost $5.00-$10.00. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Buck, Mr. Denison.

61. (I) Principles of Animal Nutrition

Scientific principles of nutrition in both ruminants and non-ruminants. 3 Class hours. Credit, 3. Mr. Anderson.

64. (II) Applied Animal Nutrition

Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Prerequisite, Animal Science 61. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Lyford.

67. (I) Physiology of Reproduction

Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation. 3 class hours, 1 2-hour laboratory period. Credit, 4. Mr. W. Black.

68. (II) Comparative Animal Genetics

The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation. Prerequisite, Zoology 53. 3 class hours. Credit, 3. Mr. Fox.

73. (I) Poultry Management

Principles of poultry business management. Designed to give the student a comprehensive view of all phases of the poultry industry. Field trips cost $10.00-$15.00. 3 class hours. Credit, 3. Mr. Grover.

74. (II) Dairy Herd Management

Dairy cattle and milk production in New England and the United States, including a study of managerial problems concerned with successful dairying. Field trips cost $10.00-$15.00. 2 class hours, 2 2-hour laboratories. Credit, 4. Mr. Foley.

79. (I) Light Horse Management

Breeds and adaptations; feeding, training and management; tack and its care, brief introduction to equitation. Field trips cost $5.00-$10.00. Open to all University students. 1 class hour, 1 2-hour laboratory period. Credit, 2. Staff.

95. (I) 96. (II) Seminar. Review of Current Literature in Animal Science

Credit, 1 each semester.

97. (I) 98. (II) Special Problems
Independent study for qualified seniors in specific subject areas, involving either extensive literature review or an experimental approach to a research problem. Credit, 1-3 each semester.

DAIRY TECHNOLOGY

65. (I) Unit Operations
A study of the technical principles involved in the handling and processing of milk and dairy products. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mr. Potter.

66. (II) Quality Control and Standards
The relationship of composition, handling, processing, storage and market regulations to the chemical and bacteriological quality of milk and its products. 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Evans.

97. (I) 98. (II) Special Problems in Dairy Technology
Problem work under staff supervision, intended to introduce qualified seniors to research methods in some phase of Dairy Technology. Credit, 1-3. Staff.

ENTOMOLOGY AND PLANT PATHOLOGY

Head of Department: Professor J. H. Lilly. Professors Shaw, Sweetman, Wheeler; Associate Professors Hanson, Rohde, Miss Smith; Assistant Professors Agrios, Banfield, Wave.

Courses in entomology acquaint students with all phases of insects and insect control, as well as beekeeping. Trained entomologists find positions in public service and industry, such as teaching at all levels; research, quarantine and regulatory work in state or federal service; various roles in public health and pest control activities; research, sales, and public relations work in the agricultural chemicals industry; and apiculture. Entomology majors are expected to take Entomology 26 and 35 and Agricultural and Food Economics 1 in the freshman or sophomore years, and Zoology 35 and Chemistry 27 or 33 in the sophomore year. In the junior and senior years Entomology 55, 56, 57, 81 and one elective from Entomology 60, 66, 72, 74, 79 and 80 are required, along with Zoology 53 and Statistics 21. Electives in entomology and other fields are recommended by the student's adviser according to individual needs. For those anticipating research or teaching careers, requiring graduate study, electives should stress basic sciences and liberal arts courses: botany, chemistry, English, modern languages, zoology and statistics. Students interested in medical entomology should include microbiology, parasitology and public health courses. For work in the fields of pest control, extension, quarantines, or agricultural chemicals, electives from agronomy, forestry, horticulture, plant pathology, speech and courses in applied entomology are recommended.

26. (I) (II) General Entomology
A brief survey of the entire field of entomology: structure, development, classification, biology, and control of insects. Formation of an insect collection. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Lilly, Miss Smith.

35. (I) Principles of Applied Entomology

A broad basic applied course for both majors and non-majors. General principles of pest control are stressed instead of "how-to-do-it" details. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wheeler.

55. (I) 56. (II) Classification of Insects (1963-64)

The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; second semester: other orders. Either semester may be elected independently. Given in alternate years. Prerequisite, Entomology 26. 3 2-hour laboratory periods. Credit, 3. Miss Smith.

57. (I) Insect Morphology (1964-65)

The external and internal anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology. Given in alternate years. Prerequisite, Entomology 26. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Hanson.

60. (II) Structural Pest Control

Identification, biology and specific control measures of arthropod and rodent pests in structures, foods, fabrics, and miscellaneous products during transportation and in homes. Prerequisite, Zoology 1; Entomology 26 desirable. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Sweetman.

72. (II) Forest and Shade Tree Insects

The principles and methods of controlling insects which attack trees and forest products. A study of important species, their identification, biology, and specific control measures. 2 class hours, 2 2-hour laboratory periods. Credit, 4 (3 for students who have had Entomology 26). Mr. Hanson.

74. (II) Medical and Veterinary Entomology (1965-66)

Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests. Given in alternate years. Prerequisite, Entomology 26. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Shaw.

79. (I) Animal Ecology

Relations of animals to their physical and biotic environment, with observations and quantitive measurement of these factors and responses in the field and laboratory. Prerequisite, Entomology 26 or Zoology 1. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Sweetman.

80. (II) Insect Control (1964-65)

The science of pest control: chemical, biological, ecological, mechanical and legislative. The need, application, economics, effectiveness and hazards from insecticides and biological control are emphasized. Given in alternate years. Prerequisites, Entomology 35, 55, 57 or equivalent; 79 and 81 desirable. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Sweetman.

81. (I) Insect Physiology (1964-65)

Detailed consideration is given to the organ systems, showing the functions such as nutrition, respiration, and growth, and the relationship of physiology to behavior. Prerequisites, Entomology 26 and Zoology 35; Entomology 55, 56, and 57 desirable. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Wave.

90. (I) (II) Evolution

The course and dynamics of both inorganic and organic evolution are treated, as are the implications of evolutionary concept on human philosophy, behavior and welfare. 3 class hours. Credit, 3. Mr. Hanson.

97. (I) 98. (II) Special Problems in Entomology

Supervised problem work in entomology or apiculture for qualified students. Prerequisites, Entomology 26 and permission of staff. Credit, 1-3. Staff.

APICULTURE

66. (II) Principles of Apiculture (1964-65)

Honeybees and their relatives, structure and biology of bees, methods of management, diseases, pollination, queen rearing, honey production, and history of beekeeping. Given in alternate years. Prerequisite, Entomology 26 or Zoology 1. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Shaw.

PLANT PATHOLOGY

51. (I) General Plant Pathology

A basic course in plant pathology dealing with the nature, cause and control of plant diseases; epidemiology, diagnosis and control receive special attention. Prerequisite, a course in Botany. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Agrios.

69. (I) Forest and Shade Tree Pathology

The nature, cause and control of the principal types of disease in trees, including decay of forest products, and of standing and structural timbers. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Banfield.

78. (II) Nematology

Anatomy, morphology and classification of plant-parasitic and other soil-inhabiting nematodes. Parasitic relationships with plants and current control measures will be stressed. Prerequisite, a year of biological science. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Rohde.

90. (II) Insect Transmission of Plant Diseases (1965-66)

The interrelationships between insects, plants, microorganisms and environment are considered in relation to the development of plant diseases, emphasizing various roles played by arthropods. Prerequisite, a year of biological science. 3 class hours. Credit, 3. Mr. Banfield.

97. (I) 98. (II) Special Problems in Plant Pathology

Supervised problem work in plant pathology, including nematology, for qualified students. Prerequisites, Plant Pathology 51 and permission of staff. Credit, 1-3. Staff.

FOOD SCIENCE AND TECHNOLOGY

Head of Department: Professor William B. Esselen. Professors Fagerson, Francis, Hayes, Levine, Lundberg; Associate Professors Hultin, Nawar, Sawyer, Stumbo; Assistant Professors Cournoyer, Hunting, Wrisley.

The Department of Food Science and Technology offers two curricula: Food Science and Technology and Restaurant and Hotel Management (page 146).

FOOD SCIENCE AND TECHNOLOGY

The curriculum in Food Science and Technology provides scientific and technological training in the principles concerned with the processing, preservation, and packaging of foods and food products. The

student's background in chemistry, physics, and microbiology is oriented to food technology problems and food analysis. Major fields open to graduates include: (1) technical and production work in the food industries; (2) quality control and analytical work related to food products; (3) government food inspection and grading; (4) technological work and research in government, industry, and education. The selection of supporting courses depends upon the objective of the student, which should be determined as early as possible. Food Science and Technology majors should take Physics 3 and 4 and Chemistry 29 and 32 in the sophomore year; also, if possible, Microbiology 51. Students planning to take physical chemistry should complete Mathematics 29 and 30. In the junior and senior year Agricultural Engineering 81 and 82, Microbiology 64 and Public Health 90, Chemistry 51 and 52 and 65 or Biochemistry and Food Science 51, 52, 61, 62, 91, 92, 95 and 96 are required, plus elective courses selected with the guidance of the major adviser.

51. (I) Introductory Food Science

A basic course, primarily for department majors, covering food manufacture, processing, distribution and spoilage problems. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Esselen.

52. (II) Food Chemistry

The composition of food products. Changes that occur in the chemistry of foods during storage and processing. Enzymes in the food industry. Prerequisite, Food Science 51. 2 class hours, 1 4-hour laboratory period alternate weeks. Credit, 3. Mr. Hultin.

61. (I) Industrial Technology

A survey of commercial practices in the manufacture and preservation of food products. Prerequisites, Food Science 52; Agric. Eng. 81. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Levine.

62. (II) Industrial Technology

A continuation of Course 61. Includes senior research problems. Prerequisite, Food Science 61. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Levine.

75. (I) and (II) Principles of Food Technology

For students not majoring in food science and technology. The important food products, with emphasis on raw materials used, processing methods and examination of packaged foods. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Esselen.

91. (I) Analysis of Food Products

Physical, chemical, microbiological and microscopical methods will be employed. Prerequisites, Food Science 52; Bacteriology 31; Chemistry 30. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Hunting.

92. (II) Objective Analytical Methods and Instrumentation

A continuation of Course 91. Prerequisite, Food Science 91. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Hunting.

94. (II) Sensory Evaluation Methods

An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretation; taste, odor, color, and texture measurements. For seniors only. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Sawyer.

95. (I) 96. (II) Food Science Literature

For seniors who specialize in food science and technology. 2 class hours. Credit, 2. Staff.

FORESTRY AND WILDLIFE MANAGEMENT

Head of Department: Professor Arnold D. Rhodes. Professors Gatslick, MacConnell; Associate Professors Abbott, Cole, Greeley, Mader; Assistant Professors Bond, Hoadley; Mr. Mawson.

FORESTRY

The technical curriculum in forestry is concentrated in the field of Forest Management, and leads to the degree of Bachelor of Science. It has professional status, being accredited by the Society of American Foresters. Graduates are prepared for employment with federal and state agencies and in private industry. The curriculum emphasizes the multiple-use concept of forest land management for wood, water, wildlife, and outdoor recreation. It stresses the scientific and economic foundations of forestry rather than methods. The first two years are devoted largely to science, English, and other cultural-foundational subjects; the last two years mainly to professional subjects of the major. Following the sophomore year students are encouraged to undertake summer work giving practical field experience in forestry. Majors in forestry take Forestry 55, and 78 during six weeks in the summer following the freshman year; Forestry 25, Physics 3 and 4, Economics 25, Government 25, Civil Engineering 27, Agronomy 22, and Geology 50, in the sophomore year; Forestry 53, 54, 56, 59, 75, and 84, Botany 67, and Wildlife Management 61, plus social science and humanities requirements in the junior year; and Forestry 57, 71, and 80, Plant Pathology 69, and Entomology 72 in the senior year. Forestry 74, 82, and Agricultural Economics 78 are recommended electives. For students with an interest in Wood Utilization and Technology, the forestry curriculum described above is modified materially to permit the inclusion of courses in mathematics, engineering, business administration, and wood technology.

25. (I) Wood Anatomy and Identification

A basic anatomical study of wood elements, their various structural characteristics and function; practice in identification. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Hoadley.

26. (II) Dendrology

The taxonomic features, silvical characteristics, and distribution of the principal tree species of temperate North America; a description of the forests where they occur. Prerequisite, Botany 1. 2 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Abbott.

52. (II) Properties of Wood

The physical and mechanical properties of wood and their importance in wood utilization. Techniques for physical measurement and mechanical testing. Prerequisite, Forestry 25. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Hoadley.

53. (I) Silvics

Forest ecology as a foundation for silviculture, watershed management, wildlife management, and forest recreation; environmental factors; development of trees and forest communities; forest influences. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mader.

54. (II) Forest Soils

Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and range management; forest soil description, classification and mapping. Prerequisite, Agronomy 22. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mader.

55. (I) (1965-66) and (Summer) The Elements of Forest Mensuration

The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data. 2 class hours, 1 4-hour laboratory period. Credit, 3. Summer course, 3 44-hour weeks. Mr. Mawson, Mr. MacConnell.

56. (II) The Principles of Silviculture

Forest culture for wood crops: regeneration and intermediate cuttings, silvicides, prescribed burning, site treatment, slash disposal; interactions with management for water, wildlife, and outdoor recreation. Prerequisite, Forestry 53 recommended. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Rhodes.

57. (I) Forest Economics and Policy

Development of land use and legislation affecting forest resource policy in the U. S. Forest resources distribution, consumption and demand, taxation, credit, and social-economic factors. 3 class hours. Credit, 3. Mr. Bond.

59. (I) Forest Protection

Principles of protecting forests from fire, insects, diseases, domestic animals, wildlife, and atmospheric agencies with special emphasis on the prevention and control of forest fires. 3 class hours. Credit, 3. Mr. Abbott.

71. (I) Aerial Photogrammetry

Principles of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces. Photographic interpretation and map making from aerial photographs. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. MacConnell.

74. (II) Lumber Manufacture and Distribution

The lumber industry; milling and processing, log and lumber grading, lumber storage and distribution. 3 class hours. Credit, 3. Mr. Hoadley.

75. (I) Forest Products

A survey of the principal forest products, their manufacture and distribution. 3 class hours. Credit, 3. Mr. Gatslick.

78. (Summer) Harvesting of Forest Products

Basic concepts of harvesting methods with emphasis on supervision. Field exercises in harvesting techniques followed by a week's trip visiting industrial forest operations. 3 44-hour weeks. Credit, 3. Mr. Bond, Mr. MacConnell.

80. (II) Principles of Forest Management

Multiple-use management of forest land for wood, water, wildlife, and recreation; organization of the forest for sustained-yield management; preparation of management plans. Prerequisite for the laboratory, Forestry 55. 3 class hours, 1 4-hour laboratory period. Laboratory period optional for non-forestry majors. Credit, 5 or 3. Mr. MacConnell.

82. (II) Artificial Propagation of Forests, and Forest Tree Improvement

Reproductive characteristics of trees; artificial propagation of forest stands by direct seeding and planting; nursery management; and forest tree improvement through provenance tests, selection and hybridization. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Abbott.

84. (II) Advanced Forest Mensuration

The analysis of growth and yield in forest stands; construction of standard volume tables and yield tables; plotless cruising and continuous forest inventory. Prerequisite, Forestry 55. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mawson.

85. (II) Wood Seasoning and Preservation

Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment. In alternate years. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Gatslick.

95. (I) 96. (II) SEMINAR

Specialized study in a selected area of forestry or wood technology. For seniors only. 3 class hours. Credit, 3.

97.(I) 98. (II) Selected Problems

Individual work on an assigned problem or project in forest management or wood utilization. For qualified juniors and seniors. Total credits for two semesters not to exceed six. Credit, 2-4. Staff.

WILDLIFE AND FISHERIES BIOLOGY

Wildlife and fisheries biology is concerned with the acquiring and application of knowledge concerning terrestrial and aquatic animal populations which are of recreational or commercial value. This knowledge includes the dynamics of animal populations, and their responses to changes in environmental conditions, including changes incurred by land use and direct exploitation by man. A broad understanding of geology, forestry, soils, agriculture, botany, and zoology is required.

The activities of state and federal conservation agencies within the state provide study material and field demonstrations. The Massachusetts Cooperative Wildlife and Fishery Research Units and the Massachusetts Divisions of Fisheries and Game and Marine Fisheries provide numerous opportunities for students to participate in and observe management and research activities.

Graduates in this field find employment primarily in state and federal conservation agencies. Depending on degree of training, individuals may also find careers in teaching in public schools or higher institutions of learning.

During the first two years basic courses in liberal arts, Botany 26 or Forestry 26, and Agricultural and Food Economics 1 are taken. Students interested in Wildlife Biology take Wildlife Biology 61, Zoology

81, Agronomy 22 (or Wildlife Biology 64), Zoology 35, Zoology 80, and English 51 during the sophomore year. Juniors and seniors take Zoology 25, 71, 72, and 82, Fisheries Biology 68, Geology 1 or 50, Wildlife Biology 62, 63, and 64 (or Agronomy 22), Botany 81 or Forestry 53, Botany 80, and Statistics 77.

Students interested in Fisheries Biology take Zoology 35, 81, and 86, Wildlife Biology 61, and English 51 during the sophomore year. Juniors and seniors take Zoology 25, 71, 72, and 74, Botany 80 and Botany 81 or Forestry 53, Geology 1 or Geology 50, Agronomy 22, Fisheries Biology 65, 66, and 68, and Statistics 77.

WILDLIFE BIOLOGY

27. (I) Conservation of Natural Resources

Natural resources of the United States including soil, water, forests, wildlife, and the important minerals; conservation problems in relation to national prosperity. 3 class hours. Credit, 3. Staff.

61. (I) Principles of Wildlife Management

Fundamental ecology and principles of wildlife management with emphasis on population characteristics and responses. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

62. (II) Techniques of Wildlife Management

Methods of collecting and interpreting data in wildlife management with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

63. (I) Management of Wetland Wildlife (1964-65)

Life histories, identification, and habitat requirements of waterfowl and marshland furbearing animals; management of wetland habitats. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

64. (II) Management of Upland Wildlife (1965-66)

Life histories, identification, and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

97. (I) 98. (II) Special Problems in Wildlife Management

Qualified seniors who have completed most of the wildlife courses may arrange for work on a special problem in a selected phase of wildlife management. Total credits for two semesters may not exceed 6. Credit, 2-4. Mr. Greeley, Mr. Sheldon.

FISHERIES BIOLOGY

65. (I) Techniques of Fisheries Management

Principles and techniques of fishery management, stressing population growth dynamics, and field procedures. Prerequisite, Zoology 86. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

66. (II) Physiology of Fishes (1964-65)

Study of physiological functions relative to the environment of fishes. The adaptation of local species to particular habitats will be studied in the field. Prerequisite, Zoology 86. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

68. (II) Survey of Fisheries Resources

Review of the sport and commercial fisheries of the United States, with special emphasis on crustaceans, molluscs and fishes. Coastal field trips by arrangement. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

97. (I) 98. (II) Special Problems in Fisheries Biology

Individual work for qualified seniors on an assigned problem or project in the field of fisheries biology. Total credits for two semesters may not exceed 6. Credit, 2-4. Mr. Cole, Mr. McCann.

LANDSCAPE ARCHITECTURE

Head of Department: Professor Raymond H. Otto. Professors King, Procopio; Associate Professors Bacon, Mosher; Assistant Professors Hamilton, Kantianis, Kent; Mr. Whitney.

Students following this curriculum, which is accredited by the American Society of Landscape Architects, are prepared through a broad academic approach to take up work in the various phases of landscape architecture. This applied-design profession is concerned with the development of land, i.e. improving our physical environment, for human use and enjoyment. In addition to the usual areas of interest, such as site planning for private, semi-public and public works of many types, an optional program in urban and regional planning is now available. The department also offers the ancillary subjects of architecture, arboriculture and park management. Because of technical requirements, the basic curriculum in this major differs considerably from the typical College of Agriculture program, and a total of 125 credits is required for graduation.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Mathematics 7, Algebra and Trigonometry	3	Speech 3	2
Chemistry 1, General	3	Botany 1, General	3
Government 25, American	3	Sociology 25, Introductory	3
Art 33, Basic Drawing	3	Agronomy 22, Soils	3
(Military or Air Science 11	1)	Land. Arch. 2, Drafting	3
Physical Ed. 1a, b	0	(Military or Air Science 12	1)
		Physical Ed. 2a, b	0

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Literature	3	English 26, Literature	3
Geology 1 or 50, Physical	3	Entomology 26 or Horticulture 2	3
Civil Engin. 27, Plane Surveying	3	Lnad. Arch. 24, Construction	4
Land. Arch. 23, Survey of L. A.	3	Land. Arch 28, Basic Design	3
Land. Arch. 25, Graphics	3	Land. Arch. 30, Plant Materials	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

During the junior and senior years, Landscape Architecture 53, 54, 55, 59, 67, 68, 71, 74, 81 and 82 are required, with some adjustments for students preferring city planning as a career. The program is completed with a second social science and suitable electives.

LANDSCAPE ARCHITECTURE

2. (II) Landscape Drafting

The mechanical aspects of the designer-draftsman, including the simple projections — orthographic, perspective, and isometric. 3 2-hour laboratory periods. Credit, 3. Mr. Procopio.

23. (I) Survey of Landscape Architecture

The history and literature of landscape architecture and allied fields, including an examination of traditional styles of gardens. 3 class hours. Credit, 3. Mr. Otto.

24. (II) Topography and Construction

Contour interpolation, grading and drainage, drive design, profiles and sections, computation of earthwork. Application of surveying to landscape construction. Prerequisites, Civil Engineering 27; Landscape Architecture 2. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Staff.

25. (I) Graphics

The two and three-dimensional graphic expression of landscape architects, using various media, techniques, papers and reproduction processes. 3 2-hour laboratory periods. Credit, 3, Mr. Kent.

28. (II) Basic Design

The elements and principles of design, the analysis of composition, and the application in design of forms and motifs, drawn from nature. Prerequisites, Landscape Architecture 2 and 23, or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Otto.

30. (II) Plant Materials

Detailed study ot deciduous and evergreen trees, with special reference to mature form and character, means of identification, natural associations, and uses in landscape work. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Hamilton.

51. (I) Principles of Arboriculture

Maintenance of shade and ornamental trees. Development of municipal and private shade tree programs. Prerequisite, a year of biological science. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. King.

53. (I) Intermediate Design

Projects involving the fundamentals of landscape design integrating theory, analysis, research, application and graphics. Prerequisites, Landscape Architecture 2, 28. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Kent.

54. (II) Intermediate Design

Spatial organization, intuitive aspects of design, and perceptual studies within comprehensive projects. Field trip required, approximate cost $40.00. Prerequisites, Landscape Architecture 24, 53. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Kent.

55. (I) Construction Details

A series of problems in architectural garden features as walks, steps, walls, fences, pools and small structures. Prerequisite, Landscape Architecture 24. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Procopio.

59. (I) Plant Materials

Detailed study of shrubs and woody vines, and their identification, with special emphasis given to their adaptability to landscape uses, methods of handling, and care. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Hamilton.

63. (I) Park Administration

A study of the history, administration and financing of parks. National, state, county, city and private park organizations and their demands. 2 class hours and 1 2-hour laboratory period. Credit, 3. Mr. Whitney.

64. (II) Park Administration

Basic problems of planning and operation of park systems. 1 class hour and 2 2-hour laboratory periods. Credit, 3. Mr. Whitney.

67. (I) Architecture

Architectural development, including styles and forms in architecture, especially as affected by materials and methods of construction. 2 75-min. class hours. Credit, 3. Mr. Kantianis.

68. (II) Architectural Design

The relations between exterior and interior spaces and structures as a primary element in design and construction. A series of problems integrating theory, design analysis, and graphics. Prerequisite, Landscape Architecture 67. 1 class hour, 2 3-hour laboratory periods. Credit, 4. Mr. Kantianis.

71. (I) Planting Design

The utilization of plant materials in combination as applied to the many conditions and demands of landscape work. Prerequisites, Landscape Architecture 30, 59. 2 3-hour laboratory periods. Credit, 3. Staff.

73. (I) 74. (II) City Planning

The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. 3 class hours. Credit, 3. Mr. Bacon.

75. (I) 76. (II) Projects in Planning

An application of the principles of modern civic development through a series of problems on the design of various types of urban land areas. Prerequisites, Landscape Architecture 73, 74, or permission of instructor. 3 2-hour laboratory periods. Credit, 3.

77. (I) 78. (II) Urban Problems

Housing, industrial location and development, decentralization, arterial systems, civic and metropolitan design, and regional planning. Open to non-majors. Prerequisites, Landscaping Architecture 73, 74, or permission of the instructor. 3 class hours. Credit, 3. Mr. Bacon.

81. (I) 82. (II) Advanced Design

Comprehensive site planning projects covering the major areas of landscape and urban design, plus Exchange Problems whenever applicable. Field trip required, approximate cost $40.00. Prerequisites, Landscape Architecture 53, 54. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Procopio.

84. (II) Presentation

Preparation and rendering of landscape and architectural plans, elevations, perspectives, etc. 2 2-hour laboratory periods. Credit, 2. Mr. Kent.

96. (II) Professional Practice

A seminar on the methods and procedures of the professional office. Prerequisite, Landscape Architecture 81, or permission of instructor. 1 class hour. Credit, 1. Mr. Otto.

97. (I) 98. (II) Special Problems

Supervised individual work on assigned projects for qualified seniors. Elected only on permission of adviser. Credit, 1 3. Staff.

PLANT AND SOIL SCIENCE

The Departments of Horticultural Science, Agronomy and Plant Pathology.

The major in Plant and Soil Science permits specialization in many areas of agronomy, soil science, horticulture and plant pathology. Emphasis is on basic sciences that will prepare students for a wide variety of careers in research, teaching, industry, business, marketing, sales, production, and regulatory services with state and federal agencies.

A major in plant science will be required to take a basic core group of subjects related to the physical, biological, social sciences and humanities plus certain specified and free electives that relate to his or her major field of interest under the direction of the staff adviser — in Horticultural Science: F. W. Southwick, A. W. Boicourt; Agronomy and Soil Science: W. G. Colby, J. Troll; Plant Pathology: C. J. Gilgut, R. A. Rohde.

Sophomore Year

English 25 and 26; Entomology 35; Chemistry 27 or 33; Physics 3 and 4; an elective in the Humanities; Economics 25; Soil Science 22; a specialization elective; and Physical Education.

Junior and Senior Years

Plant Pathology 51; Botany 57 and 67; Zoology 53; Agronomy 60; Horticulture 62; two Social Sciences; Plant and Soil Science 95 and 96; and twelve electives.

Students specializing in Horticultural Science will take Horticulture 31, 51, 59 and 65. Recommended courses for Soil Science students include Soil Science 57, 79 and 84; Mathematics 29 and 30; Chemistry 51, 52, 65, 66, 67 and 68; and Geology 42. Students interested in Turf Management should elect Soil Science 57 and Agricultural Engineering 55 and 57. In Plant Pathology recommended courses are Statistics 21, Botany 66, Microbiology 51 and Chemistry 27 and 33.

AGRONOMY

Agronomy: Head of Department: William G. Colby. Professor Drake; Assistant Professors Baker, Michelson, Southwick, Troll, Vengris, Zak; Mr. Waddington.

52. (II) Forage and Field Crops

Analysis of the principles involved in the establishment, fertilization and harvest management of forage and field crops. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Colby.

53. (I) Agrostology

The establishment and maintenance of turf grasses used on lawns, athletic fields, highways. airports and cemeteries. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Troll.

60. (II) Soil-Plant Mineral Nutrition

Study of mineral nutrients in the growth of plants; use of fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities. 2 class hours. 1 2-hour laboratory period. Credit, 3. Mr. Drake.

65. (I) Ecology and Control of Weeds

Identification and ecology of common weeds; principles of weed control with special emphasis on the use of chemical herbicides. 3 class hours. Credit, 3. Mr. Vengris.

HORTICULTURAL SCIENCE

Horticultural Science: Head of Department: F. W. Southwick. Professors Boicourt, Lachman; Associate Professor Weeks; Assistant Professors Goddard, Jester, Maynard, Tuttle; Mr. Anderson.

2. (II) Basic Plant Science

An introduction to some of the important structural features, physiological principles and environmental factors that are related to the growth and development of horticultural crops. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Anderson, Mr. Maynard.

31. (I) Plant Propagation (1965-66)

Anatomical and physiological basis of asexual and sexual horticultural plant reproduction. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Goddard.

51. (I) Deciduous Orchard Science (1965-66)

The physiological and nutritional principles upon which deciduous tree fruit production is based. Responses of the plants to environmental influences and cultural practices. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Anderson.

53. (I) Small Fruit Technology (1964-65)

Basic principles underlying the production of small fruits. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Anderson.

55. (I) 56. (II) Retail Floral Design

Basic principles of design as applied to commercial floral arrangements. Non majors excluded without special permission. Laboratory fee, $6.00 per semester. 2 3-hour laboratory periods. Credit, 3. Mr. Jester.

57. (I) Taxonomy of Horticultural Plants (1965-66)

Study of plant families, genera, species and cultivars in the field of Horticultural Science. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Boicourt.

58. (II) Floricultural Science

A study of the science and art of this phase of horticulture for non majors. Laboratory fee, $4.00 per semester. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Boicourt, Mr. Jester.

59. (I) Physiology of Greenhouse Crops (1964-65)

The influence of the artificial greenhouse environment on the vegetative and reproductive growth of plants. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Goddard.

62. (II) Plant Breeding

Improvement of horticultural crops using established genetic principles and methods. Prerequisite, Zoology 53. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Lachman.

65. (I) Physiology and Nutrition of Vegetable Crops

A study of factors influencing the growth and culture of vegetable plants. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Maynard.

73. (I) Produce Marketing Practices

Methods and techniques relative to post-harvest handling, quality control and pre-cooling practices; marketing standards; and inspection services. 3 class hours. Credit, 3.

74. (II) Merchandising of Perishables

Methods, techniques, and materials for prepackaging perishable produce, market outlets, handlers, methods of sale, marketing regulations, brands, and promotion practices. 3 class hours. Credit, 3.

PLANT PATHOLOGY

See courses in Plant Pathology listed on page 135 under the Department of Entomology and Plant Pathology.

SOIL SCIENCE

22. (II) Soils

Fundamentals of soil science covering development, properties and management of soils and the interrelationship of soils to plant growth. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Zak.

57. (I) Soil Formation

The development of soils as related to physical, chemical, biological, climatic and geological factors. 3 class hours. Credit, 3. Mr. R. A. Southwick.

79. (I) Soil Physics (1964-65)

Physical properties of soil, including textural, water, air and temperature relationships; their measurement, evaluation and influence in the soil system. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Waddington.

84. (II) Soil Chemistry (1965-66)

Inorganic and organic chemical reactions related to the nutrient supply in the soils and soil nutrition of plants including colloidal aspects. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Baker.

PLANT AND SOIL SCIENCE

95. (I) 96. (II) Seminar

Credit, 1-2. Staff.

97. (I) 98. (II) Special Problems

Credit, 1-3. Staff.

RESTAURANT AND HOTEL MANAGEMENT

Professor Lundberg, Assistant Professors Cournoyer and Wrisley.

The curriculum in Restaurant and Hotel Management is offered by the Department of Food Science and Technology. The program is de-

signed to give the student a general well-rounded background of arts and sciences, coupled with professional training for the hotel, restaurant, and other food service industries. The nature of the food service industry requires persons with broad, general backgrounds of business training coupled with a scientific knowledge of foods. In the sophomore year Restaurant and Hotel Management majors should take Accounting 25, Chemistry 33, and Restaurant and Hotel Management 33 the first semester and Accounting 26, Microbiology 1, and Home Economics 30 the second semester. In the junior and senior years Agricultural Engineering 53, Finance 65, Restaurant and Hotel Management 77, 78, 81, 82, 95 and 96, Food Science 75, General Business 71, Home Economics 54 and 92, and Public Health 63 are required plus elective courses selected with the guidance of the major adviser.

33. (I) Introductory

An introductory course in restaurant and hotel operations. 3 class hours. Credit, 3. Mr. Lundberg.

77. (I) Food Service Practices

Functional study of personnel. Advertising and promotion methods. Labor procurement and policies. Job training and evaluation. Cost controls. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Lundberg.

78. (II) Stewarding

A study of practices used by the food service industry pertaining to purchasing, receiving, and issuing food, beverages, and other supplies. Principles of food and beverage cost control. 3 class hours. Credit, 3. Mr. Wrisley.

81. (I) Hotel Practice

Elements of hotel management. 3 class hours. Credit, 3. Mr. Wrisley.

82. (II) Laws of Innkeeping (Institution Law)

Law as applied to hotels and food service establishments; includes a consideration of bailments, torts, regulations, insurance, and sanitation. Prerequisite, General Business 71. 3 class hours. Credit, 3. Mr. Cournoyer.

95. (I) 96. (II) Seminar

Survey of current food service literature and reports. Outside speakers on selected professional topics. 2 class hours. Credit, 2. Mr. Cournoyer.

VETERINARY SCIENCE

Head of Department: Professor Glenn H. Snoeyenbos. Professor Smith.

The Department offers supporting courses to assist students who expect to enter the various fields of agriculture, wildlife management, public health, teaching and laboratory work in the biological sciences. Pre-veterinary students are registered with the pre-medical advisory committee and are counselled in the Department of Veterinary Science. Details of the curriculum are shown on page 62 under the pre-medical curriculum.

72. General Veterinary Pathology

An introduction to the study of animal diseases. The causes, development, transmission and control, with application to diseases of animals which are of economic and/or public health importance. Prerequisites, Microbiology 1 or Zoology 35. 3 class hours. Credit, 3.

SCHOOL OF BUSINESS ADMINISTRATION

H. B. KIRSHEN, *Dean*

The Faculty of the School of Business Administration is keenly aware of the dynamic changes taking place in our Economy, the extensive shifts in occupations and professions and the consequent need for intelligent and well educated businessmen. The continuing advancement of technology, science and the behavioral sciences has placed upon Schools of Business Administration the necessity, not only to probe into the developments of its own areas of education but also into the relationships that exist among other areas such as Mathematics, Economics, Psychology, Sociology and Government.

The School of Business Administration prepares students to take advantage of important economic opportunities and eventually to assume positions of responsibility in business. The School's educational program is directed toward the broad aspects of business, encouraging high standards of ethical conduct, broad social responsibilities and the development of competence in particular courses of study of the student's own interest, aptitude and choice.

The first two years emphasize general education by providing fundamental courses in the humanities, mathematics, science and social science. In addition, basic courses in accounting and economics prepare the student for further work in the School of Business Administration. The junior and senior years emphasize a greater degree of specialization and provide for this in the programs indicated below. But even in these last two years all students need to view business as a whole in so far as a "core" of courses can do this. This "core" of courses is listed below under the junior-senior curricula and is required of all students. Elective courses, whether in the freshman-sophomore years or in the junior-senior years require the consent of a student's faculty adviser. A total of at least 120 credit hours (122 for Accounting majors) is required for graduation exclusive of credit received in the required physical education courses. Each course of study leads to the degree of Bachelor of Business Administration.

The passing of a comprehensive examination is a requirement for a degree for majors in the department of accounting. Comprehensive examinations may also be required by other departments of the School. Beginning with the class of 1964 all students in the School of Business Administration must attain, as a graduation requirement, a 2.0 average in Accounting 25 and 26, Elementary Economic Statistics 21, and the junior "core" courses: Finance 55, Financial Institutions; Finance 65, Corporation Finance; General Business 71, Business Law I;

Management 61, Principles of Management; and Marketing 53, Principles of Marketing. The "core" must be completed by the end of the junior year unless a student, on recommendation of his department chairman, has received permission from the Dean to postpone any such course to the senior year.

Students transferring to the School of Business Administration from any School or College within the University shall receive junior and senior elective credit only for those courses passed with a grade of C or better.

The School of Business Administration is a member of the American Association of Collegiate Schools of Business.

FRESHMAN YEAR

In each subject a one year sequence is required

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3*	2	Speech 3*	2
Mathematics	3-4	Mathematics	3-4
Hist. 5, 25, or Govt. 25	3	Hist. 6, 26, or Govt. 26	3
Science: elect one	3	Science: continue 1st sem. sci.	3
Chemistry 1		Chemistry 2	
Physics 3		Physics 4	
Botany 1		Botany 25	
Geology 1		Geology 2	
Zoology 1		Zoology 25 or 35 or Botany 1	
Elective †	3	Elective †	3
(Military or Air Science 11	1)	(Military or Air Science 12	1)
Physical Ed. 1a, b**	2	Physical Ed. 2a, b**	2

** Not quality point credit.

* May be taken either semester.

† If a language is elected the student must complete the intermediate year to meet the basic School requirement.

If a language is not elected:

Where Government has been elected the student shall elect one of the following:

History 5, 6, 25, 26, Economics 12.

Where History has been elected the student shall elect Government 25.

The students shall select, with the help of an advisor, a one-semester elective.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Humane Letters	3	English 26, Humane Letters	3
Economics 25, Elements	3	Economics 26, Prob. of Nat'l Economy	3
Accounting 25, Introduction I	3	Accounting 26, Introduction II	3
Psychology 1, General	3	Sociology 25, Introduction to	3
Statistics 21*	3	Mathematics 22*	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b †	2	Physical Ed. 32a, b †	2

* Statistics or Mathematics may be taken either semester.

† Not quality point credit.

JUNIOR-SENIOR CURRICULA

Courses and major programs are listed under four departments in the School of Business Administration: Accounting, General Business and Finance, Management, and Marketing. Irrespective of any major selected a certain "core" of courses is required of all students.

Required Core Courses	*Credits*
Finance 55, Financial Institutions	3
Finance 65, Corporation Finance	3
General Business 71, Business Law	3
Management 61, Principles of Management	3
Marketing 53, Marketing Principles	3

Elective courses shown in major programs are selected with the aid and consent of the student's adviser.

ACCOUNTING

Chairman of Department: Associate Professor John W. Anderson. Professor Singer; Associate Professors Dennler, Lentilhon; Assistant Professors Fitzgerald, Krzystofik, Stanhope; Mr. Sullivan.*

The accounting program is designed to prepare students for public accounting and for positions as accountants in business, industry and government.

	Credits
Required "core" courses	15
Required courses in the major:	20
Acct. 61, Intermediate Accounting	
Acct. 62, Intermediate Accounting	
Acct. 63, Cost Accounting	
Acct. 65, Advanced Accounting	
Acct. 73, Federal Income Tax Procedures	
Gen. Bus. 72, Business Law II or Gen. Bus. 73, Business Law III	
One elective course in Accounting	3
Four elective courses	12
Four elective courses outside Business Administration	12

25. (I) and (II) Introduction to Accounting I

An introduction to the principles underlying the collection, recording, and interpretation of accounting data. 3 class hours. Credit, 3. Staff.

26. (I) and (II) Introduction to Accounting II

A continuation of Accounting 25 with major emphasis on accounting for corporations, partnerships and manufacturers. Prerequisite, Accounting 25. 3 class hours. Credit, 3. Staff.

27. (I) Introduction to Accounting

A one semester course to combine the coverage of Accounting 25 and 26. 5 class hours. Credit, 5. (Not offered, 1964-65.) Staff.

*On leave of absence.

61. (I) (II) 62. (I) (II) Intermediate Accounting

A two semester course developed to meet the needs of two groups of students: (1) the general business student for whom the intermediate course may be the final course in accounting; (2) the accounting major for whom the intermediate course is a foundation for further specialized courses. In the first semester, the fundamental process of recording, summarizing and reporting are studied with particular reference to basic concepts applicable to the measurement of income and presentation of financial condition. An intensive examination of the theoretical support for practice and procedures of asset accounting is made. The second semester is devoted to the study of the presentation of equity-claims against assets of a corporation. A thorough background of financial statement analysis is developed with particular reference to the flow of funds statement. A critical appraisal of publications of the American Accounting Association, the American Institute of Certified Public Accountants and various house organizations is an important part of this course. Prerequisite, Accounting 26 or 27. 4 class hours. Credit, 4. Mr. Fitzgerald, Mr. Sullivan.

63. (I) and (II) Cost Accounting

Methods of cost determination for job order, process, and standard cost systems, with emphasis on cost control and interpretation. Prerequisite, Accounting 26. 3 class hours. Credit, 3. Mr. Krzystofik, Mr. Lentilhon, Mr. Dennler.

64. (II) Advanced Cost Accounting

A continuation of Accounting 63 with emphasis on budgetary control; direct costs; and cost analyses for control and decision-making. Prerequisite, Accounting 63. 3 class hours. Credit, 3. Mr. Lentilhon, Mr. Krzystofik, Mr. Dennler.

65. (I) Advanced Accounting

A course designed to give the accounting major a thorough grounding in partnership accounting, installment sales, consignment sales and preparation of consolidated financial statements. Prerequisite, Accounting 62. 4 class hours. Credit, 3. Mr. Fitzgerald, Mr. Sullivan.

67. Governmental Accounting

Special features of budgetary and fund accounting as applied to municipalities, other governmental units and institutions, such as hospitals and schools. Prerequisite, Accounting 25. Credit, 2. Mr. Anderson.

72. (I) Administrative Costing and Control

A case study approach to the significance of quantitative data for decision making. Prerequisite, Accounting 26 or 27. 3 class hours. Credit, 3. Mr. Singer. (not open to students majoring in Accounting)

73. (I) and (II) Federal Income Tax Procedure

A study of federal income tax laws and regulations as they affect individuals; the preparation of tax returns. Prerequisite, Accounting 25 or 27. 3 class hours. Credit, 3. Staff.

74. (II) C.P.A. Problems

Extensive practice in solution of problems from C.P.A. examinations. Topics covered include governmental and institutional accounting, estates, trusts, receiverships, liquidations and consolidations. Prerequisite, Accounting 65. 3 class hours. Credit, 3. Mr. Anderson.

77. Auditing and Internal Control

Basic principles of auditing with emphasis on theory, types of audits, duties and responsibilities of the auditor, audit programs and methods of internal control. A complete audit is developed through the use of an audit case. Prerequisites, Accounting 62 and 63. 3 class hours. Credit, 3. Mr. Krzystofik.

78. (II) Advanced Federal Tax Procedures

A continuation of Accounting 73 emphasizing corporations, partnerships, estates and trusts, gifts and estate taxes. Prerequisite, Accounting 73. 3 class hours. Credit, 3. Mr. Anderson, Mr. Lentilhon.

97. (I) 98. (II) Independent Study and Research

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1-3. Staff.

GENERAL BUSINESS AND FINANCE

Chairman of Department: Professor James B. Ludtke. Professor Cheng; Associate Professors Kyler, Rivers, Smart; Assistant Professors Burak, Theilman; Instructor Tessier.

The department offers four programs of study and specially designed programs for those students who wish to combine business administration with one or more related fields of study. The program in General Business provides a breadth of knowledge and viewpoint and is designed for those students who are uncertain as to their specific career objectives. The program in Financial Management is designed for those students who wish to prepare for careers in the area of planning and controlling the financial operations of business firms and governmental units. The two other formal programs reflect the large number of requests for programs relating to economics and urban planning. The program in Business Administration Economics combines these two areas into an integrated program of study. The program in Urban and Regional Studies combines courses from many disciplines, including economics, sociology, government, civil engineering, landscape architecture, and agricultural economics. The specific content of the special program option is mutually determined by the Department Chairman and the interested student at the beginning of the junior year.

Curriculum in Finance	*Credits*
Required "core" courses	15
Other required courses:	18
Fin. 75, Principles of Insurance, or	
Fin. 76, Life Insurance	
Fin. 81 and 82, Problems in Business Finance I and II	
Fin. 83, Investments	
Acct. 61, Intermediate Accounting, or	
Acct. 63, Cost Accounting	
Econ. 73, Modern Economic Theory and Analysis	
Electives in area of concentration, with a minimum of 9 credit hours in Business Administration and Economics	15
Electives outside of Business Administration and Economics	12

Curriculum in General Business

Required "core" courses	15
Other required courses: Gen. Bus. 72 or 73, Business Law Fin. 81, Problems in Business Finance I, or Mgt. 92, Problems in Management, or Mkt. 80, Problems in Marketing, or Gen. Bus. 78, Administrative Statistics	6
Electives in Business Administration	12
Electives in Economics	6
Electives outside Business Administration and Economics with a minimum of 9 credit hrs. in Government, Sociology, and/or Psychology	21

Curriculum in Business Administration and Economics

Required "core" courses	15
Other required courses: Mgt. 67, Management-Union Relations I Econ. 56, Business Fluctuations and Forecasting Econ. 73, Modern Economic Theory and Analysis	9
Electives in Business Administration and Economics, with a minimum of 12 credit hours in Economics	24
Electives outside of Business Administration and Economics	12

Curriculum in Business Administration with an area of concentration in Urban and Regional Studies	*Credits*
Required "core" courses	15
Other required courses: Gen. Bus. 67, Public Utilities Gen. Bus. 68, Real Estate	6
Electives in Business Administration and Economics	15
Electives in Government, Sociology, Agricultural Economics, Civil Engineering, Landscape Architecture	15
Electives outside Business Administration, Economics, and an area of concentration	9

GENERAL BUSINESS

65. (1) Principles of Transportation

The development and growth of transportation as a function of production and distribution of goods; rate structures and transportation laws as they affect the relationships between carriers and shippers. 3 class hours. Credit, 3. Mr. Rivers.

66. (II) Traffic Management

A case and problem approach to the regulation, management, and traffic functions in transportation. Three field trips required. Prerequisites, Gen. Bus. 65 and consent of instructor. 3 class hours. Credit, 3. Mr. Rivers.

67. (I) Public Utilities

The nature, organization and administration of regulated industries; aspects of public regulation at Federal, State and Local levels as the affect service operations. 3 class hours. Credit, 3. Mr. Rivers.

68. (II) Real Estate

A comprehensive survey of real estate principles and practices; the mechanics of the real estate market and the economic and legal factors that influence it. 3 class hours. Credit, 3. Mr. Burak.

71. (I) and (II) Business Law I

The law of contract and sales. 3 class hours. Credit, 3. Mr. Burak, Mr. Smart.

72. (II) Business Law II

The law of agency and negotiable instrument and time permitting, bankruptcy and wills. Prerequisite, Gen. Bus. 71. 3 class hours. Credit, 3. Mr. Smart.

73. (I) Business Law III

The law of partnerships, corporations and property. Prerequisite, Gen. Bus. 71. 3 class hours. Credit, 3. Mr. Smart.

78. (II) Administrative Statistics

Probability and statistical distributions applied to business management problems. Application of Bayes' theorem to sampling for business decision-making under uncertainity. 3 class hours. Credit, 3. Mr. Cheng.

97. (I) 98. (II) Independent Study and Research

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, I-3. Staff.

FINANCE

55. (I) and (II) Financial Institutions

The American financial system and the functional relationships between financial institutions and the economic activities of households, business firms and governmental units. Prerequisites, Economics 25 and Accounting 25 or consent of Instructor. 3 class hours. Credit, 3. Staff.

65. (I) and (II) Corporation Finance

Corporate financial behavior: Appraisal of factors affecting decision-making regarding the sources and application of funds. Introduction to the capital budgeting and cost of capital problem. Prerequisite, Accounting 25 or consent of instructor. 3 class hours. Credit, 3. Mr. Rivers, Mr. Tessier, Mr. Theilman.

75. (I) Principles of Insurance

Risks encountered by individuals and business firms and the methods and institutions which have been established to insure against financial losses. The various forms of insurance are studied primarily from the buyers' point of view. 3 class hours. Credit, 3. Mr. Kyler.

76. (II) Life Insurance

The application of life insurance to the problems of family security, business security, investments, and estate protection. 3 class hours. Credit, 3. Mr. Kyler.

81. (I) Problems of Business Finance I

Short and intermediate-term financing; decision-making under uncertainty regarding needs and sources of funds. Prerequisite, Finance 65. 3 class hours. Credit, 3. Mr. Cheng.

82. (II) Problems in Business Finance II

Long term financing, capital budgeting, reserves and dividend policy, pensions, company expansion, merger and consolidation, reorganization. Prerequisite, Finance 65. 3 class hours. Credit, 3. Mr. Cheng.

83. (I) Investments

The development of a general theory of investment management and its application to individual and institutional investors including Computer Portfolio Management. Prerequisites, Finance 55, and Finance 65 or consent of instructor. 3 class hours. Credit, 3. Mr. Theilman.

84. (II) Security Analysis

Examination of factors affecting investment values of securities and the methods used in their analysis. Prerequisite, Finance 83 or consent of instructor. 3 class hours. Credit, 3. Mr. Tessier.

MANAGEMENT

Acting Chairman of Department: Associate Professor Sidney J. Claunch. Professor O'Donnell; Associate Professor Conlon; Assistant Professors Elkins, T. Johnson.

Industry and business offer qualified students an opportunity to find careers in General Management, Production Management, and in Personnel Management and Industrial Relations. Course programs are offered in each of these fields and provide the student both a specialized and a comprehensive understanding of the managerial process in business enterprises and other formal organizations.

	Credits
Required "core" courses	15
Required courses in the three major programs:	12
Mgt. 64, Personnel Management	
Mgt. 81, Theory of Business Administration	
Mgt. 85, Management of Production I	
Mgt. 92, Problems of Management	
Seven elective courses from a recommended list	21
Four elective courses outside Business Administration	12

61. (I) and (II) Principles of Management

The basic course dealing with the fundamental principles and practices of the managerial process in business enterprises. 3 class hours. Credit, 3. Mr. Claunch, Mr. T. Johnson.

64. (I) and (II) Personnel Management

The principles and policies followed by management in the procurement, development, direction and control of personnel. 3 class hours. Credit, 3. Mr. Elkins, Mr. T. Johnson.

67. (I) Management-Union Relations I

A comparison of union-management objectives, functions and structures, including the scope and impact of union penetration into areas of managerial authority. Prerequisites, Management 61 or 64. 3 class hours. Credit, 3. Mr. Conlon.

68. (II) Management-Union Relations II

The problems involved in the interpretation and administration of collective bargaining agreements are studied by use of the case method of analysis. Prerequisite, Management 67, or consent of instructor. 3 class hours. Credit, 3. Mr. Conlon.

69. (I) Wage and Salary Administration

A study of the objectives, procedures and problems involved in the establishment and administration of operative and executive compensation plans. Prerequisite, Management 64. 3 class hours. Credit, 3. Mr. Johnson.

81. (I) Theory of Business Administration

Principles of administration; modern organization theories; specialization, functionalization, coordination, planning, and control; authority, status, leadership, decision-making, communication, and power-structuring. Prerequisite, Management 61. 3 class hours. Credit, 3. Mr. O'Donnell, Mr. Elkins.

85. (I) Management of Production I

The basic principles of production management. The use of statistical, mathematical, and simulation methods in the production aspect of an organization's activities. Prerequisite, Management 61. 3 class hours. Credit, 3. Mr. Claunch.

86. (II) Management of Production II

The application of principles and analytical techniques to the design and operation of production systems. Quality control, inventory and production control. Prerequisite, Management 85. 3 class hours. Credit, 3. Mr. Claunch.

89. (I) Management Decision Simulation

A course involving participation in the management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market positions. Prerequisite, Senior Standing and permission of instructor. 2 class hours. Credit, 2. Mr. Claunch, Mr. Elkins.

92. (II) Problems of Management

An integrating course dealing with the problems of management embracing the organic management functions, using cases for analysis and systematic decision-making practice. Prerequisites, Management 61 and Senior Class Standing. 3 class hours. Credit, 3. Mr. O'Donnell, Mr. Elkins.

95. (I) 96. (II) Seminar in Management

The first semester is devoted to advanced study in the theory and practice of administrative organization and behavior. The second semester involves a critical analysis of selected problems in the field of production management. Either semester may be elected independently. Prerequisite, Senior Class Standing and permission of the instructor. 3 class hours. Credit, 3. Staff.

97. (I) 98. (II) Independent Study and Research

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1-3. Staff.

MARKETING

Chairman of Department: Professor Harold E. Hardy. Assistant Professors Drew-Bear, Johnson, Zane.

Students are prepared for a variety of positions in wholesale and retail enterprises and in the marketing activities of manufacturers. The program includes specialized study of basic types of market operations such as advertising, sales management and marketing research.

Curriculum in Marketing	*Credits*
Required "core" courses	15
Required courses in the major:	15
Mkt. 54, Salesmanship and Sales Management	
Mkt. 62, Marketing Research	
Mkt. 71, Retailing Principles	
Mkt. 73, Advertising	
Mkt. 80, Problems in Marketing	
Three elective courses from a recommended list	9
Two elective courses	6
Five elective courses outside Business Administration	15

Curriculum in Retailing	
Required "core" courses	15
Required courses in the major:	15
Mkt. 54, Salesmanship and Sales Management	
Mkt. 62, Marketing Research	
Mkt. 71, Retailing Principles	
Mkt. 73, Advertising	
Mkt. 86, Problems in Retailing	
Three elective courses from a recommended list	9
Three elective courses	9
Four elective courses outside Business Administration	12

53. (I) Marketing Principles

The problems involved in the distribution of industrial and consumer goods including wholesaling, retailing and sales promotional activities. 3 class hours. Credit, 3. Staff.

54. (II) Salesmanship and Sales Management

The principles and practices of selling; the management of sales personnel and the control of sales operations. 3 class hours. Credit, 3. Mr. Johnson.

62. (II) Marketing Research

The aims, sources and fact-gathering methods of marketing research activities. Individual case study and research projects. 3 class hours. Credit, 3. Mr. Drew-Bear.

71. (I) Retailing Principles

Basic concepts of retailing with case studies of retail management problems. 3 class hours. Credit, 3. Mr. Drew-Bear.

73. (I) Advertising

The techniques and media of advertising, its services to business and the organization and economic functions of the advertising industry. 3 class hours. Credit, 3. Mr. Hardy.

74. (II) New England Markets

Individual and group study of New England Markets and the marketing problems of New England industrial enterprises. 3 class hours. Credit, 3. Mr. Zane.

75. (I) Credits and Collections

The principles and practices of mercantile and retail credit management including the sources and analysis of credit information, collections procedures and control and the rights of creditors. 3 class hours. Credit, 3. Mr. Johnson.

76. (II) Purchasing

The purchasing organization and practices of industrial enterprises. 3 class hours. Credit, 3. Mr. Zane.

79. (I) Wholesaling

A study of wholesale marketing with emphasis on the marketing activities of manufacturers and wholesale middlemen in the industrial goods area. 3 class hours. Prerequisite, Marketing 53, or equivalent. Credit, 3. Mr. Zane.

80. (II) Problems in Marketing

The interrelations between research planning and the execution of sales programs with case studies showing the effects of various marketing policies upon individual firms. Prerequisite, Marketing 53. 3 class hours. Credit, 3. Mr. Hardy.

84. (II) Problems in Advertising

Application of basic marketing knowledge in planning and analyzing advertising campaigns, research appropriations, the determination of the advertising budget and the choice of media and the subsequent measurement of effectiveness. Prerequisites, Marketing 53 and 73. 3 class hours. Credit, 3. Mr. Hardy.

86. (II) Problems in Retailing

Case analysis and decision covering pricing; merchandise management; buying and selling policies; store systems; personnel; accounting control; plant operation. Prerequisites, Marketing 53 and 71. 3 class hours. Credit, 3. Mr Drew-Bear.

97. (I) 98. (II) Independent Study and Research

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1-3. Staff.

SCHOOL OF EDUCATION

A. W. PURVIS, *Dean*

The School of Education through its undergraduate program seeks to utilize the forces of the University to prepare teachers for elementary and secondary schools and through its graduate offering to prepare administrators and specialists in public education. Its program is based upon the assumption that teachers and other school personnel should have a broad liberal education, considerable mastery of at least one field, and professional courses which should lead to a knowledge of the persons to be taught, familiarity with the problems to be met, and practice in the best techniques of teaching and supervision. In all of this the School of Education takes the position that teacher education is a University function and that success will come only if the School is successful in maintaining the closest possible relationships with other schools and departments that contribute to the program.

All students who contemplate teaching as a career should register early, in their freshman year if possible, with the School of Education although their courses in education do not begin until the junior year. In general, students are admitted without question to the various service courses of the junior and senior years, but admission to the teacher-training program of the concentrated semester block is determined by a composite rating based on scholarship as shown by University grades (a three-year average at least as high as the University median is desired), success in the beginning courses in education, recommendations of University teachers in general education fields, and personality ratings by members of the staff.

Elementary School Teaching

Candidates for this program major in elementary education. In certain cases, with the approval of the Dean of the School of Education, the student may be permitted to major in some department of the College of Arts and Sciences where the general education program is deemed the equivalent of that designed for elementary education majors. This permission should be requested in freshman year. Such students will satisfy the requirements of their major department so far as the first two years are concerned but they should utilize their electives to take such courses as Government 25, Zoology 54, History 25, 26 and Art or Music which are recommended by the School of Education. They should take Education 9, 39, 59. The core program for elementary education majors including Education 51 and 64, and Psychology 65 or Home Economics

HD70, and the Elementary Education Block should be taken in the junior and senior years.

Students with a major in Elementary Education take the following courses:

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3*	2	Speech*	2
Math. 1 or 9 or Chem. 1	3	Math. 2 or 10 or Chem. 2	3
Zool. 1 or Bot. 1	3	Bot. 1 or Zool. 1	3
Foreign Lang.**	3	Foreign Lang.**	3
History 5	3	History 6	3
Education 9 †		Education 9 †	
(Military or Air Science 11 (men)	1)	(Military or Air Science 12 (men)	1)
Physical Ed. 1a, b ††	2	Physical Ed. 2a, b ††	2

* May be taken either semester.
** Intermediate Proficiency Required.
† To be completed in a school year.
†† Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25	3	English 26	3
Psychology 1	3	Sociology 25 or Econ. 25	3
Science*	3 or 4	Zool. 54	4
Government 25	3	Music 1 or Art 14	3
History 25	3	History 26	3
Education 39 †		Education 39 †	
(Military or Air Science (men)	1)	(Military or Air Science (men)	1)
Physical Ed. 31a, b ††	2	Physical Ed. 32a, b ††	2

* To be chosen from sophomore courses in the College of Arts and Sciences.
† To be completed in a school year.
†† Not quality point credit.

JUNIOR AND SENIOR YEARS

During the junior year the student takes Education 51, 59, 64, Psychology 65 or Home Economics HD70. Music 85 and Geography 35 are required. One semester of senior year is devoted to the concentrated Elementary Education Block (Ed. 60, 61, 62, 85). The student must utilize his junior-senior electives to take at least 30 credits in the College of Arts and Sciences, of which at least 15 credits should be concentrated in a minor.

Secondary School Teaching

All candidates for secondary school teaching will major in the subject field to be taught and minor in education. A maximum of eighteen hours should be taken in this minor. Education 51 and Psychology 56 are required during junior year and Education 52, 88, 85 (called the secondary block) in one semester of senior year. Since the concentrated semester block in secondary school teacher-training carries only twelve credits students should consult with their major adviser regarding means of making up the extra three credits, and of meeting all their major requirements in the three semesters of junior and senior years. Carrying an extra course during the secondary block semester is not permitted.

Special Field Programs for Prospective Teachers

In Vocational Agriculture (Mr. Judge, adviser). This program is based on a cooperative agreement between the University and the Vocational Division of the State Department of Education which provides supervisors and consultants in conducting the program. Students otherwise qualified may prepare to teach vocational agriculture by the satisfactory completion of Education 72, 73, and 75. Education 52 is also recommended. To insure a desirable range of preparation, students who contemplate vocational teaching should consult Professor Judge early in the freshman year if possible. A vocational teacher-training certificate is awarded by the Vocational Division to those who fully qualify.

In Home Economics (Mrs. Sullivan, adviser). These students will major in home economics and minor in education. They should elect Education 51, Psychology 56, Home Economics Education 82 and the concentrated semester block (Education 52, 85).

In Teacher Coaching (S. W. Kauffman, adviser). These students will major in physical education and minor in education. They should elect Psychology 56 and the concentrated semester block (Education 52, 88, 85). They should elect a minor teaching field from the College of Arts and Sciences consisting of a minimum of eighteen hours.

In Music (D. Alviani, adviser). These students will major in music and minor in education. They should elect Education 51, Psychology 56, Music 87, and the concentrated semester block (Education 52, 85).

EDUCATION

Dean: Professor Albert W. Purvis. Professors Anthony, Jones, C. V., Oliver, Wyman; Associate Professors Kornegay, O'Leary, Pippert; Assistant Professors Benz, Byrne, Clegg, Cohen, Eddy, Fredrickson, Hall, Hillman, Jones, R. C., Judge, McManamy, Rosemier, Thelen, Warner, Wellman; Messrs. Cebula, King, Mastroianni, Sleeman.

9. (I) (II) Directed Observation

Twelve hours in the Laboratory School in the freshman year. Prerequisite to the Elementary Education Block. Credit, 0.

39. (I) (II) Directed Observation

Fifteen hours in the Laboratory School in the sophomore year. Prerequisite to the Elementary Education Block. Credit, 0.

51. (I) (II) History of Education

Educational movements are traced from early Greece to the present with the aim of better understanding of modern problems. 3 class hours. Credit, 3. Mr. Eddy, Mr. Cohen, Mr. Wellman.

52. (I) (II) Principles and Methods of Teaching

By means of discussion, case studies, and current educational literature, teaching ideals and procedures are set up and applied to the major teaching fields. 3 class hours. Credit, 3. Mr. Anthony, Mr. Thelen, Mr. Warner, Mr. Hillman.

53. (I) (II) Educational Tests and Measurements

The most serviceable tests for measuring achievement are considered; test construction, administration, scoring, and interpretation of results are studied and applied to the classroom. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Rosemier.

59. (I) (II) Directed Observation

Twenty hours in the Laboratory School in the junior year. Prerequisite to the Elementary Education Block. Credit, 0.

60. (I) (II) Elementary School Curriculum

The elementary school curriculum from the standpoint of content and methodology. Emphasis placed on the unit method and the activitiy programs. 3 class hours. Credit, 3. Mr. Clegg.

61. (I) (II) Teaching of Elementary Reading and Language Arts

Discussions and demonstrations of principles and effective practices in the teaching of all phases of the language arts. 3 class hours. Credit, 3. Miss O'Leary, Mr. Benz, Mr. Byrne.

62. (I) (II) Teaching of Elementary Arithmetic and Science

Accepted methods and materials in the teaching of arithmetic and science in the elementary grades will be studied and demonstrated. 3 class hours. Credit, 3. Mr. Hall, Mr. King.

64. (I) (II) Principles of Elementary Education

The aim, organization, program, pupil population, of the elementary school and the relationship between elementary and secondary school are the areas of concentration. 3 class hours. Credit, 3. Miss McManamy.

66. (I) (II) Preparation and Use of Audio-Visual Materials

Study is made of available machines, materials and techniques for teaching groups of students. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wyman, Mr. Mastroianni, Mr. Sleeman.

72. (I) Vocational Education in Agriculture

A survey of vocational agricultural education and an introduction to teaching of vocational agriculture at the secondary level. Admission by permission of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Judge.

73. (I) (II) Apprentice Teaching in Agriculture

A full year in absentia normally following the junior year, teaching agriculture, horticulture, and related subjects under a supervising teacher in selected schools. Prerequisites, Education 72 and 75. Credit, 6. Mr. Judge.

75. (II) Technique of Teaching Vocational Agriculture

The materials, methods, policies, and special requirements of Massachusetts for teaching vocational agriculture and related subjects in high schools and in special county agricultural schools. Prerequisite, Education 72, or permission of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Judge.

77. (I) (II) Principles of School Guidance

The need for guidance in the schools, the nature of guidance, and an overview of an adequate guidance service for a school system. 3 class hours. Credit, 3. Mr. Fredrickson.

85. (I) (II) Observation and Student Teaching

In cooperating schools under staff supervision. Given only in the elementary and secondary concentrated blocks. Prerequisites for secondary block: Education 51 and Psychology 56; for elementary block; Education 9, 39, 51, 59, 64; Psychology 65 or Home Economics HD 70. Credit, 6. Mr. Jones and Staff.

88. (I) (II) Secondary School Curriculum

Learning materials and activities and their organization in various teaching fields. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Hillman, Mr. Kornegay, Mr. Thelen, Mr. Warner.

SCHOOL OF ENGINEERING

E. E. LINDSEY, *Acting Dean*

The departments of Chemical Engineering, Civil Engineering, Mechanical Engineering and Electrical Engineering comprise the School of Engineering. Each department offers a curriculum leading to a Bachelor of Science degree in that particular branch. A Bachelor of Science curriculum in Industrial Engineering is offered in the Mechanical Engineering department. All curricula are accredited by the Engineers Council for Professional Development.

Engineering can be defined as the combination of science and art by which materials and power are made useful to mankind. An engineer requires intensive technical training but at the same time he should acquire the broad education that distinguishes the professional man from the technician. His education does not end with formal schooling but continues throughout his life as he accumulates experience.

The curricula in engineering have been carefully prepared to offer each student the opportunity to acquire the sound training in mathematics and the basic sciences of chemistry and physics upon which is built the work in the engineering sciences. In the senior year courses are offered which enable the student to use his previous training for engineering analysis, design and engineering systems in his particular field of interest. About twenty per cent of his time is devoted to studies in the social science and humanistic area. Some opportunity is provided to elect courses from both the technical and humanistic-social fields. The curriculum of the freshman year is the same for all. Specialization to a limited extent begins in the sophomore year.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Math. 6 Introd. Calculus	4
Math. 5, Introd. Eng. Math.	4	Chem. 2 or 4, General*	3 or 4
Chem. 1 or 3 General*	3 or 4	M. E. 2, Desc. Geom.	3
M. E. 1, Graphics	2	Physics 6, General	3
Physics 5, General	3	(Military or Air Science 12	1)
(Military or Air Science 11	1)	Physical Ed. 2a, b †	2
Physical Ed. 1a, b †	2		

* It is recommended that Chemical Engineering majors take Chemistry 3 and 4 in place of Chemistry 1 and 2.

† Not quality point credit.

CHEMICAL ENGINEERING

Head: Professor John W. Eldridge. Professor Cashin; Associate Professor Duus; Assistant Professors Novak, Roblee; Visiting Lecturer Chappelear.

Chemical engineering is concerned with the development of manufacturing processes in which chemical or certain physical changes of materials are involved. These are resolved into a coordinated series of unit operations (physical changes) and unit processes (chemical changes). The work of the chemical engineer is primarily concerned with the design, construction, and operation of equipment and plants in which these are applied. Chemistry, physics, and mathematics are the underlying sciences of chemical engineering, and economics is its guide in practice. Chemical engineers are employed not only in industry manufacturing chemicals but in many others, such as petroleum refining, coal processing, refractories and clay products, cement, waste treatment, pulp and paper, rayon and textiles, paint and varnish, natural and synthetic rubber, foods, leather, plastics, soap, penicillin and other antibiotics. Much of the work of the atomic energy program is chemical engineering. The types of work done by chemical engineers include: design, construction, research, development, production, financial and patent appraisal, management, and sales.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 25, Fundamentals I	3	Ch. E. 26, Fundamentals II	3
Chem. 51, Organic	3	Chem. 52, Organic	3
Chem. 53, Organic Lab.	1	Chem. 54, Organic Lab.	1
Physics 7, General	4	Economics 25, Elements	3
Math. 31, Appl. Calculus Engrs.	4	Math. 32, Appl. Calculus Engrs.	4
English 25, Mastp. West. Lit.	3	English 26, Mastp. West. Lit.	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 55, Unit Opera. I	5	Ch. E. 56, Unit Opera. II	4
Ch. E. 75, Instrumentation	3	Ch. E. 80, Kinetics	3
Chem. 65, Physical	3	Chem. 66, Physical	3
C. E. 34, Statics	3	Chem. 67, Physical Lab.	2
English 50, Tech. Writing	2	C. E. 52, Dynamics	3
		Elective*	3

SUMMER (3 Weeks)

Ch. E. 88, Chem. Engr. Lab. 3

* Six credits must be taken in the social sciences and three in the humanities. (See page 60). The remainder may be in technical or scientific courses or in advanced military. All elective courses listed must be satisfied.

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 81, Heat-Enery Relations	3	Ch. E. 76, Automatic Control	3
Ch. E. 93, Comprehensive Problems	3	Ch. E. 82, Ind. Equil.	3
Ch. E. 95, Seminar	1	Ch. E. 94, Plant Design	3
E. E. 61, Fundamentals	4	Ch. E. 96, Seminar	1
Electives*	5-6	Electives*	6

*Six credits must be taken in the social sciences and three in the humanities. (See page 60.) The remainder may be in technical or scientific courses or in advanced military. All elective courses listed must be satisfied.

25. (I) 26. (II) Fundamentals

An introduction to the nature and scope of chemical engineering through the study of selected chemical processes and of material and energy balances. Prerequisites, Chemistry 2 or 4; Physics 4 or 6 for Course 26. 3 class hours. Credit, 3.

55. (I) Unit Operations I

Consideration of the thermodynamic properties of matter. Ideal and non-ideal systems. The Unit Operations of fluid flow, heat transfer, evaporation, and equilibrium and steam distillation. Prerequisites, Chemical Engineering 26; Mathematics 30 or 31. 4 class hours, 1 2-hour computation period. Credit, 5.

56. (II) Unit Operations II

A continuation of Course 55; including the additional unit operations of distillation, gas absorption, liquid extraction, crystallization, filtration, mixing, crushing and grinding. Prerequisite, Chemical Engineering 55. 3 class hours, 1 3-hour computation period. Credit, 4.

58. Organic Chemical Technology

Some of the unit processes involved in the manufacture of organic chemicals. Includes nitration, amination, halogenation, oxidation and esterification. Prerequisite, Chemistry 51. 2 class hours, 1 3-hour laboratory period. Credit, 3.

61. (II) Chemical Engineering Analysis

A study of mathematical techniques with application to chemical engineering problems. Emphasis is on setting up ordinary differential equations corresponding to specific problems and on methods for their solution, including machine computation. Prerequisite, Chemical Engineering 56. 3 class hours. Credit, 3.

75. (I) Instrumentation

A detailed study of the underlying principles and practices in indicating, recording and controlling instruments used on industrial process equipment. Prerequisite, Physics 4 or 6. 2 class hours, 1 3-hour laboratory period. Credit, 3.

76. (II) Automatic Process Control

A study of the theoretical and practical factors governing automatic control of industrial processes. Topics include: control systems, review of measurement devices, control modes, mathematical relationships and analysis of control systems. Prerequisites, Chemical Engineering 56 and 81; Mathematics 32. 2 class hours, 1 3-hour laboratory period. Credit, 3.

77. (I) Elements of Unit Operations

Primarily for engineering science students. Emphasis is on the scientific principles of the Unit Operations. Molecular and turbulent transport transport of heat, mass and momentum are considered in detail. Prerequisite, Engineering Science option, or permission of instructor. 3 class hours. Credit, 3.

78. (I) Advanced Unit Operations

A more detailed study of certain unit operations with emphasis on heat transfer. Prerequisite, Chemical Engineering 56. 2 class hours. Credit, 2.

80. (II) Kinetics

Principles underlying the rates of transformations of matter and energy. Review of the pertinent differential equations; effect of temperature and catalysis on chemical reaction rates; application to design of chemical reactors. Prerequisite, Chem. 65. 3 class hours. Credit, 3.

81. (I) Heat-energy Relations

Types of energy, energy balances, second law, thermodynamic functions, P-V-T relations of fluids, compression and expansion processes. Prerequisites, Chemistry 66; Chemical Engineering 56. 3 class hours. Credit, 3.

82. (II) Industrial Equilibria

Phase and chemical equilibria and rates of reaction in chemical processes from the industrial point of view. Prerequisites, Chemistry 66; Chemical Engineering 81. 3 class hours. Credit, 3.

83. (I) Survey of Nuclear Engineering (I)

An introduction to the principles of reactor physics and a survey of problems involved in the design and operation of nuclear reactors. Also problems in heat transfer, shielding, instrumentation and waste disposal. Prerequisites, Chemistry 2 or 4; Physics 4 or 6; Mathematics 30, or equivalent; and permission of the instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3.

84. (II) Survey of Nuclear Engineering (II)

A continuation of Chemical Engineering 83 with emphasis on reactor physics. Prerequisite, Chemical Engineering 83. 2 class hours, 1 3-hour laboratory period. Credit, 3.

87. (I) Process Equipment Design

The design of process equipment for the chemical industries; riveted pressure vessels, welded pressure vessels, piping, attachments and closures, etc. Prerequisites, Chemical Engineering 55; Civil Engineering 52. 1 class hour, 1 3-hour laboratory period. Credit, 2.

88. (Summer) Chemical Engineering Laboratory

Study and operation of pilot plant size equipment illustrating unit operations. Emphasis is on the securing of accurate data, correct operating techniques and on report writing. Prerequisite, Chemical Engineering 56. 5 7-hour laboratory days and 5 class hours per week for 3 weeks. Credit, 3.

93. Comprehensive Problems

The solution of problems which require the use and integration of principles studied in previous courses. Final results will be determined by the application of economic considerations. Prerequisites, Chemical Engineering 56; Chemistry 66. 2 class hours, 1 3-hour computation period. Credit, 3.

94. Plant Design

The optimum design of selected chemical plants involving production rates, site location, process flow diagrams, equipment design and sizing, total plant costs and other factors. Prerequisite, Chemical Engineering 93. 2 class hours, 1 3-hour computation period. Credit, 3.

95. (I) 96. (II) Seminar

Preparation and discussion of professional topics of interest to chemical engineers. 1 class hour. Credit, 1.

97. (I) Laboratory Projects

Investigation and report on an elementary chemical engineering problem. Prerequisites, Chemical Engineering 56, 88. 1 3-hour laboratory period. Credit, 1.

98. (II) Laboratory Projects

Investigation and report on an elementary chemical engineering problem. Prerequisites, Chemical Engineering 56, 88. 2 3-hour laboratory periods. Credit, 2.

CIVIL ENGINEERING

Head of Department: Professor Merit P. White. Professors Carver, Feng, Hendrickson, Marcus, Osgood; Associate Professors Boyer, Grow, Higgins; Assistant Professors Bemben, Chajes, Dzialo, Harris, Miller.

Civil engineering is concerned with structures, transportation, movement of fluids, use and storage of water, sanitation, and surveying and mapping. A civil engineer may be engaged in research, in planning and designing, in construction, or in maintenance and operation.

The curriculum gives a thorough training in the fundamental physical sciences and at the same time prepares a student for work in any branch of civil engineering, allowing him to specialize to some extent in whatever branch is most interesting to him — sanitation, mechanics and structures, hydraulics, foundation engineering, highway engineering.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Masterpieces of Western Literature	3	English 26, Masterpieces of Western Literature	3
Math. 31, Applied Calculus for Engineers	4	Physics 7, General	4
Econ. 25, Elem.	3	Math. 32, Applied Calculus for Engineers	4
C. E. 31, Surveying I	3	C. E. 32, Surveying II	3
C. E. 34, Statics	3	C. E. 52, Dynamics	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

SUMMER

Either C. E. 28 and 30, Surveying Practice, or approved engineering employment.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
C. E. 53, Strength of Mat. I	3	C. E. 70, Theory of Struct. I	3
C. E. 55, Transport. Engr. I	3	C. E. 77, Sanitary Engr. I	3
C. E. 75, Fluid Mechanics	3	C. E. 80, Soil Mechanics I	3
M. E. 63, Engr. Thermo. I	3	Humanities Elective	3
Geol. 50, Engr. Geol.	3	English 50, Tech. Writing †	2
Soc. Sci. Elective	3	Soc. Sci. Elective	3
C. E. 76, Fluid Mechanics Lab.	1		

†May be replaced by M. E. 64

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
C. E. 71, Structural Design	3	C. E. 62, Engr. Materials	3
C. E. 78, Sanitary Engr. II	3	C. E. 73, Reinforced Concrete	3
E. E. 61, Fundamentals of E. E.	4	C. E. 90, Contracts and Spec.*	3
Technical Electives**	6	C. E. 96, Professional Sem.	1
Non-Technical Elective	3	Technical Electives**	6
		Elective	3

* May be replaced by E. E. 62.

** Technical electives must be approved by the adviser.

All elective courses listed must be satisfied. Humanities and social science electives are specified on page 60. Students taking advanced ROTC or AFROTC courses follow a somewhat different program.

27. (I) Plane Surveying

Elements of plane surveying: taping, transit, level, stadia, topographic surveying and mapping, care and adjustment of instruments. Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

28. (Summer) Surveying Practice I

Property surveys, topographic surveys by stadia and plane table, triangulation. Prerequisite, Civil Engineering 27 or 31. 3 40-hour weeks. Credit, 3. Mr. Boyer.

30. (Summer) Surveying Practice II

Preliminary route survey with plan, profile, cross sections, slope stakes, earthwork quantities. Prerequisite, Civil Engineering 32. 3 40-hour weeks. Credit, 3. Mr. Boyer.

31. (I) Surveying I

Theory of surveying. Use, care, and adjustment of tape, transit, and level; traverse computation; topographic surveying and mapping; property surveying. Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

32. (II) Surveying II

Route surveys; centerline layout; simple, compound, reverse, parabolic, and spiral curves; construction surveys; earthwork computation; chainage equations; astronomical observations. Prerequisite, Civil Engineering 31. 2 class hours. 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

34. (I) and (II) Statics

Topics considered: resultants of force systems, equilibrium of forces using algebraic and graphical methods; friction, first and second moments, center of gravity. Prerequisite, Integral Calculus, or concurrently. 3 class hours. Credit, 3.

52. (I) and (II) Dynamics

Motions of particles and rigid bodies and the force systems causing these motions. Prerequisite, Civil Engineering 34. 3 class hours. Credit, 3.

53. (I) and (II) Strength of Materials I

Simple and combined stresses and strains in tension, compression and shear; torsion; stresses and deflections in beams. Prerequisite, Civil Engineering 34. 3 class hours. Credit, 3.

55. (I) Transportation Engineering I

Major transportation systems with emphasis on geometric design of highways, transportation and traffic studies, and design and operation of railroads. Prerequisite, Civil Engineering 32. 2 class hours. 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

62. (II) Engineering Materials

A study of engineering materials with particular emphasis on physical behavior and the correlation between experimental observations and theory. Prerequisite, Civil Engineering 53. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Harris.

70. (II) Theory of Structures I

An elementary treatment of statically determinate structures, especially buildings and bridges. Prerequisite, Civil Engineering 53. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Osgood.

71. (I) Structural Design

The choosing and proportioning of the elements and connections of metal structural frames of buildings and bridges. Designs are made. Prerequisite, Civil Engineering 70. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Osgood.

72. (I) Theory of Structures II

The analysis of statically indeterminate structures by several appropriate methods. Prerequisite, Civil Engineering 70. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Osgood.

73. (II) Reinforced Concrete

The analysis and design of reinforced concrete structures. Prerequisite, Civil Engineering 53. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Grow.

74. (II) Theory of Structures III

The analysis and design of complex or special structures in metal, concrete or wood. Prerequisites, Civil Engineering 71, 72; 73 concurrently. 3 class hours. Credit, 3. Mr. Osgood.

75. (I) and (II) Fluid Mechanics

A study of the properties and behavior of fluids, involving laws of hydrostatics, kinetics and dynamics. Flow measurement, hydraulic machinery, flow in pipes and open channels. Prerequisite, Civil Engineering 52. 3 class hours. Credit, 3. Mr. Carver, Mr. Higgins.

76. (I) and (II) Fluid Mechanics Laboratory

Applications of fluid mechanics theory. Flow measurement and behavior of fluids in pipes and open channels. Prerequisite, Civil Engineering 75, concurrently. 1 3-hour laboratory period. Credit, 1. Mr. Carver, Mr. Higgins.

77. (II) Sanitary Engineering I

Water demand and quantity of sewage, water collection and distribution, sewer systems, and pumping stations. Prerequisite, Civil Engineering 75, concurrently. 3 class hours. Credit, 3. Mr. Feng.

78. (I) Sanitary Engineering II

Water and sewage laboratory analysis, stream pollution, water and sewage treatment, industrial waste problems. Prerequisite, Civil Engineering 75, concurrently. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Feng.

79. (I) Principles of Sanitary Engineering

Designed for students in the Department of Public Health, covering phases of Civil Engineering 77 and 78 with consideration of the non-engineering background of the student. Admission by permission of the instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Feng.

80. Soil Mechanics I

An elementary course in the engineering uses and properties of soils, including seepage, embankment stability, and consolidation. Prerequisite, Geology 50. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Hendrickson.

81. Soil Mechanics II

Foundations and earth structures. Interpretation of borings. Analysis and design of piles, footings, piers, abutments, and retaining walls. Prerequisite, Civil Engineering 80. 3 class hours. Credit, 3. Mr. Hendrickson.

82. Soil Testing

Sampling and testing of soils for engineering purposes. 1 class hour, 2 3-hour laboratory periods. Credit, 3. Mr. Hendrickson.

85. (I) Water and Wastewater Analysis

Analysis of water relative to its quality for various domestic and industrial uses and analysis of wastewater relative to its potentiality of pollution. Prerequisites, Chemistry 1, 2; Civil Engineering 78. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Feng.

86. (II) Sanitary Engineering III

The hydraulics and chemistry relating to water and sewage treatment plants, design criteria of treatment units. Prerequisites, Civil Engineering 77 and 78. 3 class hours. Credit, 3. Mr. Feng.

87. (I) Open Channel Flow

A study of steady flow in open channels including natural and artificial sections and elementary design of related hydraulic structures. Prerequisite, Civil Engineering 75. 3 class hours. Credit, 3. Mr. Higgins.

88. (II) Strength of Materials II

Determination of stresses and strains in elements of machines and structures. Prerequisite, Civil Engineering 53. 3 class hours. Credit, 3. Mr. White.

89. (II) Fluid Mechanics of the Oceans

An introduction to physical oceanography including tides and waves, characteristics of sea water, advective and convective processes in the ocean and atmosphere, oceanographic measurements, planetary models of the oceans.

90. (II) Contracts and Specifications

Current practice and the legal aspects of preparing construction contracts, specifications and cost estimates. 3 class hours. Credit, 3. Mr. Grow.

91. (I) Surveying III

Elements of astronomical geodetic and photogrammetric surveying; coordinate systems and map projections. Prerequisite, Civil Engineering 32. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

92. (I) Hydraulic Engineering

Hydrologic and structural considerations for hydraulic projects including studies of dams and appurtenances, hydraulic machinery, engineering economy, and the design of a typical hydroelectric development. Prerequisite, Civil Engineering 75. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Higgins.

93. (II) Introduction to Hydrodynamics

A mathematical treatment of the basic theorems of classical hydrodynamics including potential flow, conformal mapping, wave and vortex motion, Navier-Stokes equation and boundary layer theory. Prerequisite, Mathematics 32. 3 class hours. Credit, 3. Mr. Carver.

94. (II) Transportation Engineering II

The engineering aspects of traffic problems, geometric design of urban and rural highways including intersections, traffic signs and signals, and planning studies. Prerequisite, Civil Engineering 55. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Boyer.

96. (II) Professional Seminar

For senior civil engineering students. Student reports on current engineering projects and the professional aspects of civil engineering. 1 class hour. Credit, 1.

97. (I) 98. (II) Civil Engineering Project

Investigation of a problem or completion of a project significant in civil engineering. Prerequisite, permission of department. Credit, 3.

ELECTRICAL ENGINEERING

Head of Department: Professor G. Dale Sheckels. Professors Langford, Roys; Associate Professors Bett, Edwards, Fitzgerald, Laestadius, Mohn; Assistant Professors Herchenreder, Lovell, Scott; Visiting Professors Longley, Maunder.

Electrical engineering deals with the engineering applications of electricity. Because of its unusual amount of diversity, it is usually convenient to separate it into such main divisions as power, communications, electronics and control, and others. The undergraduate curriculum is designed to prepare the student for work in any of these fields and to serve as a basis for further specialization. Courses in liberal arts and in engineering courses outside of the department give the student an understanding of the broader aspects of engineering and other fields.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Mastp. West. Lit.	3	English 25, Mastp. West. Lit.	3
Math. 31, Appl. Calculus Engrs.	4	Math. 32, Appl. Calculus Engrs.	4
Physics 7, General	4	C. E. 34, Statics	3
E. E. 41, Circuit Anal. I	4	E. E. 42, Circuit Anal. II	4
Humanities Elective	3	Social Sci. Elect.	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

SUMMER (Following Sophomore Year)

E. E. 85, Electrical Measurements, 3 credit hours.
M. E. 23, Materials Processing Laboratory, 3 credit hours.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
E. E. 51, Circuit Anal. III	4	E. E. 52, Circuit Anal. IV	3
E. E. 55, Electronics I	4	E. E. 53, Energy Conversion Systems I	4
E. E. 57, Electromagnetic Fields	3	E. E. 56, Electronics II	4
M. E. 63, Engr. Thermo. I	3	M. E. 64, Engr. Thermo. II	3
C. E. 52, Dynamics	3	C. E. 53, Strength of Materials	3
English 50, Technical Writing	2	Economics 25, Elem.	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
E. E. 54, Energy Conversion Systems II	4	E. E. 96, Professional Seminar	1
C. E. 75, Fluid Mechanics or M. E. 82, Heat Transfer	3	M. E. 88, Sc. of Engr. Mat'ls.	3
Major Tech. Elective	4	Major Tech. Electives	8
Humanities or Social Science Elective	3	Social Science Elective	3
Elective	2 or 3	Elective	3
Elective	3		

All elective courses listed must be satisfied. All electives to be approved by adviser. For humanities and social science electives, see page 60. Six credits of advanced military or air science may be substituted for six credits of electives.

41. (I) 42. (II) Linear Circuit Analysis I and II

Analysis using differential relationships, free and forced responses, complex frequency, steps and impulses, poles and zeros and network theorems. Prerequisites, Mathematics 6 and Physics 6. 3 class hours, 1 3-hour computation and laboratory period. Credit, 4.

51. (I) Linear Circuit Analysis III

Polyphase circuits, coupled circuits, harmonics, Fourier series, and magnetic circuits. Prerequisite, E. E. 42. 3 class hours, 1 3-hour laboratory period. Credit, 4.

52. (II) Linear Circuit Analysis IV

The use of operational and transform methods for the solution of fundamental equations of electrical, mechanical and thermal systems, with a correlated study of functions of a complex variable. Prerequisite, E. E. 51. 3 class hours. Credit, 3.

53. (I) 54. (II) Energy Conversion Systems I and II

Principles of operation and physical aspects of energy conversion systems with a detailed analysis of performance and control of transformers and rotating electrical machinery. Prerequisite, E. E. 51. 3 class hours. 1 3-hour laboratory period. Credit, 4.

55. (I) 56. (II) Electronics I and II

Physical phenomena of electronic conduction in solids, vacua, and gases. Applications include amplifiers, rectifiers, oscillators, inverse feedback systems, computers, and other basic circuits. Prerequisite, E. E. 42, or consent of instructor. 3 class hours, 1 3-hour laboratory period. Credit, 4.

57. (I) Electromagnetic Fields

Static and time varying electromagnetic fields using vector notation. Maxwell's equations, relations between field and circuit theory. Plane waves in dielectric and conducting media. Prerequisites, Physics 6 with Mathematics 32 concurrently. 3 class hours. Credit, 3.

61. (I) Fundamentals of Electrical Engineering

A study of basic laws of electrical science as they pertain to electric and magnetic circuits. Not open to electrical engineers. Prerequisites, Physics 6, Mathematics 31 or equal. 3 class hours. 1 3-hour laboratory period. Credit, 4.

62. (II) Basic Application of Electrical Engineering

A study of the general applications of the basic laws of electrical engineering in the fields of stationary and rotating electromechanical machinery and basic electronics. Not open to electrical engineers. Prerequisite, E. E. 61. 3 class hours, 1 3-hour laboratory period. Credit, 4.

65. (I) 66. (II) Electronics I and II

These courses are identical to the lecture portions of E. E. 55 and 56. They are not open to electrical engineers. Prerequisites, Physics 26 and Mathematics 31, or equivalents. 3 class hours. Credit, 3.

77. (I) Principles of Switching Circuits I

Logical design of switching circuits with emphasis on the scientific methods available; the analysis and synthesis of switching systems using electromagnetic, electronic and solid state devices. Prerequisite, E. E. 56. 3 class hours, 1 3-hour laboratory period. Credit, 4.

78. (II) Principles of Switching Circuits II

Multiterminal and iterative circuits; circuit reliability; switching codes; alternative methods of sequential circuit design with emphasis on synchronous pulse circuits; trends in switching. Prerequisite, E. E. 77. 3 class hours. 1 3-hour laboratory period. Credit, 4.

79. (I) Communication Circuits

Theory of lumped circuits and lines including matrices, positive real functions, and synthesis methods of Foster and Cauer. Prerequisite, E. E. 52. 3 class hours, 1 3-hour laboratory period. Credit, 4.

80. (II) Electronics III

Active circuits and communication theory covering tube and semi-conductor circuitry with emphasis on aspects pertaining to information transmission. Prerequisite, E. E. 56. 3 class hours, 1 3-hour laboratory period. Credit, 4.

81. (II) Advanced Electromechanical Energy Conversion

Modern methods of analysis: Hamilton's Principle and Lagrange's Equations; matrices, dyadics and tensors; two reaction theory and symmetrical components; the generalized and special machines. 3 class hours; 1 3-hour laboratory period. Prerequisite, E. E. 54. Credit, 4.

84. (II) Industrial Electronics and Control

Industrial electronic devices and their characteristics; basic circuits and their application to commercial equipment. Prerequisites, E. E. 55, or 62. 3 class hours, 1 3-hour laboratory period. Credit, 4.

85. (Summer) Electrical Measurements

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices. Prerequisite, E. E. 42. 3 40-hour weeks. Credit, 3.

86. (II) Power System Networks

Power transfer diagrams, voltage studies, system stability criteria, short-circuit calculations, and protective methods. Prerequisite, E. E. 52. 3 class hours, 1 3-hour laboratory period. Credit, 4.

88. (II) Pulse Circuits

Generation, transmission and processing of information by means of pulses, with applications to computers, communications, radar and television. Prerequisite, E. E. 56. 3 class hours, 1 3-hour laboratory period. Credit, 4.

90. (II) Feedback Control Systems I

Analysis and design of error-sensitive control systems. Analytical and graphical determination of steady state and transient performance; applications to electrical, mechanical, and hydraulic systems. Prerequisite, E. E. 52. 3 class hours. 1 3-hour laboratory period. Credit, 4.

92. (II) Principles of Electrical Design

The fundamentals of electric, dielectric, magnetic and heat-flow systems applied to the design, performance, rating and life of coils, transformers, machinery and other equipment. Prerequisite, E. E. 54. 2 class hours, 1 3-hour laboratory period. Credit, 3.

94. (II) Microwave Engineering

Fundamental principles of communications and electromagnetism and their application to the special problems of the generation, transmission, propagation and reception of microwaves. Prerequisite, E. E. 57. 3 class hours, 1 3-hour laboratory period. Credit, 4.

96. (II) Professional Seminar

Current engineering developments are discussed through student reports. Instruction is given in the preparation of papers for publication and their presentation before technical audiences. Prerequisite, senior standing. 1 class hour. Credit, 1.

97. (I) 98. (II) Special Problems

An individual investigation carried out under the supervision of an interested staff member, or a class study of recent advances and current problems in a specialized field of electrical engineering. Prerequisite, consent of instructor. Credit, 1-4.

MECHANICAL ENGINEERING

Head of Department: Professor William H. Weaver. Professors Bates, Dittfach, Keyser, Swenson; Associate Professors Day, O'Byrne, Patterson, Rising, Sobala, Trueswell, Weidmann; Assistant Professors Bissey, Costa, Kroner Messrs. Amatangelo, Fohlin, Keramaty, Pezda, Umholtz.*

*Sabbatical leave.

Two curricula are offered by the Department of Mechanical Engineering: (1) Mechanical Engineering and (2) Industrial Engineering.

MECHANICAL ENGINEERING

Mechanical engineering is that branch of the engineering profession which, broadly speaking, covers the fields of heat, power, and the design of machinery.

Building upon a foundation of mathematics, physics, and chemistry, the department of mechanical engineering undertakes to show the student how fundamental physical laws apply to this field and to give him thorough training in the basic principles so that particular application can be mastered in professional practice. Therefore, no attempt is made to give highly specialized instruction.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Mastp. West. Lit.	3	English 26, Mastp. West. Lit.	3
Math. 31, Applied Calculus for Engineers	4	Math. 32, Applied Calculus for Engineers	4
C. E. 34, Statics	3	Physics 7, General	4
M. E. 35, Engin. Mat'l. & Proc.	4	M. E. 46, Metallurgy	3
Social Sci. Elect.	3	C. E. 53, Strength of Materials	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Ed. 31a, b*	2	Physical Ed. 32a, b*	2

* Not quality point credit.

SUMMER (Following Sophomore Year)

M. E. 25, Materials Processing Laboratory II
M. E. 26, Materials Processing Laboratory III

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
C. E. 52, Dynamics	3	C. E. 75, Fluid Mech.	3
M. E. 63, Engr. Thermodynamics I	3	C. E. 76, Fluid Mech. Lab.	1
M. E. 67, Mech. Instr. Lab.	1	M. E. 68, Kinematics	3
E. E. 61, Fundamentals	4	M. E. 64, Engr. Thermodynamics II	3
Humanities Elect.	3	E. E. 62, Applications	4
Econ. 25, Elem.	3	Engl. 50, Tech. Writ.	2

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. E. 87, Engr. Thermodynamics III	3	M. E. 80, Mech. Engr. Lab.	2
M. E. 79, Mech. Eng. Lab.	1	M. E. 82, Heat Transfer or M. E. 84, Basic Engr. Analysis	3
M. E. 83, Machine Design	3	M. E. 86, Adv. Machine Des.	3
M. E. 85, Dynamics of Mach.	4	Technical Elect.†	3
M. E. 95, Seminar	1	Non-Tech. Elect.	6
Technical Elect.†	3		
Soc. Sci. Elect.	3		

†Technical electives: M. E. 74, 75, 76, 77, 82, 84, 90, 97, 98; I. E 54, 86; C. E. 88. For humanities and social science electives, see page 60 . All elective courses listed must be satisfied. Advanced military students will be allowed up to 6 credits substitution according to Department requirements.

1. (I) Graphics

The course purpose is to develop a working knowledge of orthographic projection including multi-view drawing, sections, dimensions, pictorial representations. Objectives are met through problem solution and creative work. 2 3-hour laboratory periods. Credit, 2.

2. (II) Descriptive Geometry

The theory of orthographic projection. Geometric concepts of lines, planes, solids; solution of engineering problems involving true sizes, angles and shapes by graphical methods. Prerequisite, Mechanical Engineering 1. 1 class hour, 2 3-hour laboratory periods. Credit, 3.

23. Materials Processing Laboratory I

A lecture and laboratory course to develop a basic understanding of metal working using cutting and joining processes. Not for Industrial or Mechanical engineers. Offered immediately previous to the fall semester. Prerequisite, Mechanical Engineering I. 3 40-hour weeks. Credit, 3.

25. Materials Processing Laboratory II

An understanding of the weldability of metals using manual and automatic processes applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering I. 2½ 30-hour weeks. Credit, 2.

26. Materials Processing Laboratory III

An understanding of the machining of metals using standard machine tools applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering I. 2½ 30-hour weeks. Credit, 2.

35. (I) Engineering Materials and Processes

Properties, production, fabrication, and uses of engineering materials. Laboratory work includes mechanical testing, motion pictures, and inspection trips. Prerequisites, Chemistry 2 or 4; Physics 3 or 5, previously or concurrently. 3 class hours, 1 3-hour laboratory period. Credit, 4.

46. (II) Fundamentals of Metallurgy

Physical metallurgy involving crystal structure, solid solutions, diffusion in the solid state, freezing of metals, metal hardening, annealing, equilibrium diagrams. Heat treating processes. Prerequisite, Mechanical Engineering 35 or Chemistry 66. 2 class hours, 1 3-hour laboratory period. Credit, 3.

63. (I) Engineering Thermodynamics I

The application of the laws of thermodynamics to various energy-transforming devices, including ideal and actual cycles of steam, internal combustion engines and air compressors. Prerequisites, Physics 5 and 6; Mathematics 30 or 31. 3 class hours. Credit, 3.

64. (II) Engineering Thermodynamics II

A study of liquids and vapors, thermodynamic cycles, energy transformations, the transfer of heat plus appropriate problems. Prerequisite, Mechanical Engineering 63. 3 class hours. Credit, 3.

67. (II) Mechanical Instrumentation Laboratory

The calibration and application of instruments used in the testing of mechanical engineering apparatus. Prerequisite, Mechanical Engineering 63, taken previously or concurrently. 1 3-hour laboratory period. Credit, 1.

68. (II) Kinematics

Principles of mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions. Prerequisites, Mechanical Engineering 1; Civil Engineering 52. 2 class hours, 1 3-hour laboratory period. Credit, 3.

74. (I) and (II) Basic Aerodynamics

The basic concepts of applied aerodynamics, including properties of air, ideal fluid flow, airfoils and their properties, aircraft performance and stability. Prerequisite, Civil Engineering 76. 3 class hours. Credit, 3.

75. (I) Steam Power Plants

The steam power plant, including boilers, stokers, fuels, combustion, steam generation, prime movers, and auxiliary equipment, and engineering problems involved in design and operation. Prerequisite, Mechanical Engineering 64. 3 class hours. Credit, 3.

76. (II) Refrigeration and Air Conditioning

Fundamental principles of thermodynamics as applied to refrigeration in industrial processes and the control of temperature, humidity and motion of air in buildings. Prerequisite, Mechanical Engineering 64. 3 class hours. Credit, 3.

77. (I) Internal Combustion Engines

The thermodynamic and performance aspects of reciprocating gasoline and Diesel engines, steady flow gas turbines, turbo-jet engines and rockets. Prerequisite, Mechanical Engineering 64. 3 class hours. Credit, 3.

79. (I) Mechanical Engineering Laboratory I

Standard performance tests of steam, gasoline and Diesel engines, fans, turbines, compressors, and refrigeration systems. Process control instrumentation including digital and analog computer techniques. Prerequisite, Mechanical Engineering 67. 1 3-hour laboratory period. Credit, 1.

80. (II) Mechanical Engineering Laboratory II

Advanced project experimental work in all phases of Heat Power equipment. Prerequisite, Mechanical Engineering 79. 2 3-hour laboratory periods. Credit, 2.

82. (I, II) Heat Transfer

A study of the mechanisms of heat transfer: conduction, convection and radiation, with engineering applications. Prerequisites, Mechanical Engineering 63; Mathematics 32 or 92. 3 class hours. Credit, 3.

83. (I) Machine Design

Principles involved in the design of various machine parts. Related topics such as economy of manufacture, safety, styling, invention and creativity. Prerequisites, Civil Engineering 53; Mechanical Engineering 2, 25, 26, 68. 2 class hours. 1 3-hour laboratory period. Credit, 3.

84. (II) Basic Engineering Analysis

The application of mathematical solutions to problems in vibrations, elasticity, fluid mechanics and dynamics. The analysis of the problems and the derivation of the governing equations. Prerequisite, Mathematics 32 or 92. 3 class hours. Credit, 3.

85. (I) Dynamics of Machinery

Elements of vibration theory, vibration isolation, absorbers, instrumentation, analysis of equivalent masses and shaft systems. Dynamic balancing. Prerequisites, Mathematics 32; Civil Engineering 52; Mechanical Engineering 68. 3 class hours, 1 3-hour laboratory period. Credit, 4.

86. (II) Advanced Machine Design

Continuation of Course 83. Additional elementary parts are analyzed and some complete machines studied. Emphasis on invention and creativity. Prerequisite, Mechanical Engineering 83. 2 class hours, 1 3-hour laboratory period. Credit, 3.

87. (I) Engineering Thermodynamics III

Topics investigated include steam turbines, steam power plants, refrigeration, high-velocity flow, and shock phenomena. Prerequisite, Mechanical Engineering 64. 3 class hours. Credit, 3.

88. (II) Science of Engineering Materials

A physical explanation of the mechanical, electrical, magnetic and thermal properties of engineering materials. Prerequisites, Chemistry 2 or 4, Physics 5 and 6 or 25 and 26, or their equivalents. 3 class hours. Credit, 3.

89. (I) Instrumentation

A study of mechanical instrumentation with mechanical-electrical transducers emphasized. A few heat power experiments included. For electrical engineering majors or permission of instructor. Prerequisite, Mechanical Engineering 64. 1 class hour, 1 3-hour laboratory period. Credit, 2.

90. (II) Advanced Metallurgy

Advanced topics in engineering metallurgy, including X-ray diffraction and X-ray fluorescent analysis. Prerequisite, Mechanical Engineering 46. 2 class hours, 1 3-hour laboratory period. Credit, 3.

93. (I) Nomography

The construction of functional scales, alignment charts and proportional charts. The use of determinants in the construction of alignment charts. Prerequisite, Mathematics 2, 6 or 29. 1 class hour, 1 3-hour laboratory period. Credit, 2.

95. (I) Professional Seminar

Presentation of papers on important subjects and recent development in the field of mechanical engineering. Prerequisite, Senior standing. 1 class hour. Credit, 1.

97. (I) 98. (II) Experimental Mechanical Engineering
Special work in mechanical engineering for a senior thesis. Admission by permission of instructor. Credit, 3.

INDUSTRIAL ENGINEERING

Industrial engineering is concerned with the engineering aspects of the organization, operation and management of manufacturing plants. Consequently, the industrial engineering curriculum is built on a foundation of mechanical engineering. To the technical knowledge and scientific attitude developed through the study of engineering is added the study of certain courses in the humanities, in economics, and in management.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Mastp. West. Lit.	3	English 26, Mastp. West. Lit.	3
C. E. 34, Statics	3	Physics 7, General Physics	4
Math. 31, Applied Calculus for Engrs.	4	Math. 32, Applied Calculus for Engrs.	4
I. E. 51, Basic Industrial Engineering	3	I. E. 56, Data Processing	3
M. E. 35, Engr. Materials & Processes	4	M. E. 46, Metallurgy	3
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Physical Education 31a, b*	2	Physical Education 32a, b*	2

* Not quality point credit.

SUMMER (following Sophomore Year)

M. E. 25, Materials Processing Laboratory II, 2 credits.
M. E. 26, Materials Processing Laboratory III, 2 credits.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 50, Technical Writing	2	M. E. 63 Engr. Thermodynamics I	3
I. E. 53, Methods & Standards Engr.	4	I. E. 72, Prin. of Engr. Statistics	3
I. E. 71, Elem. Exp. Statistics	3	C. E. 53, Strength of Materials	3
Social Science Elective	3	Social Science Elective	3
Econ. 25, Elements of Economics	3	Humanities Elective	3
C. E. 52, Dynamics	3	M. E. 68, Kinematics	3

Approved engineering summer employment or 3 credits from approved courses in Economics, Mathematics, Psychology or Sociology.

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
E. E. 61, Fundamentals of Elec. Engr.	4	E. E. 62, Applications of Elec. Engr.	4
M. E. 83, Machine Design	3	I. E. 54, Engineering Economy	3
C. E. 75, Fluid Mechanics	3	I. E. 78, Manufacturing Control	3
I. E. 77, Industrial Engr. Design	2	I. E. 80, Cost Control Engineering	3
I. E. 79, Ind. Engr. Problems	3	I. E. 96, Seminar	1
Non-technical Elective	3	Non-technical Elective	3

Advanced military students will be allowed up to 6 credits substitution according to Department requirements. Humanities electives: art, English, foreign-language literature, music, philosophy. Social science electives: history, government, sociology, psychology, economics. All elective courses listed must be satisfied.

51. (I) Basic Industrial Engineering

The principles of organization and management and their application to the problems of the industrial plant. For industrial engineering majors. 3 class hours. Credit, 3.

53. (I) Methods and Standards Engineering

The principles involved in the simplification of the work pattern, the design of the work place, and in the establishment of production standards. Prerequisite, Industrial Engineering 71, previously or concurrently. 3 class hours, 1 3-hour laboratory period. Credit, 4.

54. (II) Engineering Economy

A study of the basis for comparison of alternatives in engineering projects, break-even and minimum cost points, evaluation of proposals, the economic selection and replacement of structures and machines. Prerequisites, Economics 25; Mathematics 6. 3 class hours. Credit, 3.

56. (II) Data Processing

Principles and applications of data processing and electronic computer systems for use in management for control and decision making. Prerequisite, Industrial Engineering 51 or approval of instructor. 3 class hours. Credit, 3.

I. E. 71. Basic Probability for Engineers

A study of probability and its applications to engineering which utilizes calculus to examine frequency, density and cumulative distribution functions. Distributions such as chi square, normal, binomial, etc. are treated. Hypothesis testing will be included. Prerequisite Math 6. 3 class hours. Credit, 3.

72. (I) Principles of Engineering Statistics

A study of statistical principles as applied to engineering problems including: analysis of variance, design of experiments, sampling plans, statistical quality control, industrial problem solutions. Prerequisite, Industrial Engineering 71. 3 class hours. Credit, 3.

77. (I) Industrial Engineering Design

The principles applying to the determination and development of the physical relationship between plant, equipment and operators considering the economy and effectiveness of operation. Prerequisites, Mechanical Engineering 2; Industrial Engineering 79 previously or concurrently. 1 class hour. 1 3-hour laboratory period. Credit, 2.

78. (II) Manufacturing Control

A study of the principles used to regulate production activities in keeping with the manufacturing plan. Prerequisites, Industrial Engineering 51; Industrial Engineering 79. 3 class hours. Credit, 3.

79. (I) Industrial Engineering Problems

The theory of probability, the principles of mathematical programming applied to the solution of problems in inventory control, production control, quality control, production standards. work measurement. Prerequisites, Industrial Engineering 53; Industrial Engineering 71. 3 class hours. Credit, 3.

80. (II) Cost Control Engineering

The principles for pre-determining expenses for the factors of production, the comparison of results with estimates to determine and deal with the causes of expense variations. Prerequisites, Industrial Engineering 51 and 79. 3 class hours. Credit, 3.

86. (II) Industrial Engineering Principles

Industrial engineering principles as applied to organization, plant location, plant layout, industrial costs, production control, production standards, incentives. For engineering students other than industrial engineering majors. Prerequisite, Junior standing. 3 class hours. Credit, 3.

88. (II) Motion and Time Study

The combined fields of motion study and time study. For junior and senior students outside the industrial engineering field. Prerequisite, Junior standing. 2 class hours, 1 3-hour laboratory period. Credit, 3.

96. (II) Professional Seminar

Presentation of papers on important subjects and recent development in the field of industrial engineering. Prerequisite, Senior standing. 1 class hour. Credit, 1.

97. (I) 98. (II) Industrial Engineering Projects

Special work in industrial engineering for a senior thesis or an honors program. Admission by permission of the instructor. Credit, 1-3.

ENGINEERING SCIENCE OPTION

Departmental Advisers

Engineering science is concerned with the application of the basic sciences to research and development in engineering. Thus the curriculum contains extensive mathematics, physics, and other courses in the basic sciences designed to develop the student's skill in precise physical reasoning, analysis and synthesis. The student may elect the option from one of the four engineering departments at the end of his sophomore year provided he has completed his freshman and sophomore years with a quality point average of 2.80 or above or has achieved a cumulative average of 3.20 for the two preceding semesters. The freshman year is the same for all students and the sophomore year corresponds to that of the major department in which a student is enrolled. Every student enrolled in the engineering science option must satisfy the following core curriculum:

Course	*Credits*
Chem. Eng. 77, Elements of Unit Operations	3
C. E. 34, Statics	3
C. E. 52, Dynamics	3
C. E. 75, Fluid Mechanics	3
E. E. 41, Circuit and Field Analysis I	4
E. E. 42, Circuit and Field Analysis II	4
M. E. 63, Engineering Thermodynamics I	3
M. E. 87, Engineering Thermodynamics III	3
M. E. 88, Science of Engineering Materials	3
Math. 75, Adv. Mathematics for Engineers I	3
Math. 76, Adv. Mathematics for Engineers II	3
Eng. Science Seminar (four semesters)	No credit

In addition to this core curriculum a student must satisfy certain other courses as prescribed by the department in which he is enrolled. In the

remainder of his courses required for graduation, exclusive of University and School of Engineering requirements, the student is allowed considerable flexibility, subject only to the approval of his departmental adviser. The degree received is the same as that offered by the department in which the student is enrolled.

SCHOOL OF HOME ECONOMICS

MARION A. NIEDERPRUEM, *Dean*

The School of Home Economics encompasses an area of study which applies the principles and concepts of the fundamental arts and sciences to the physiological, psychological, social, and economic environmental needs of man.

The curricula of the school have been designed to provide a liberal education with depth in specialized areas of Food and Nutrition, Textiles, Clothing and Related Arts, and Home Economics Education to insure professional competence. The transitional continuing relationships between liberal and professional education seek to develop in the student a disciplined mind, mental curiosity, and professional aspirations.

The five major curricula offered are unique to Home Economics. They are Dietetic and Institutional Administration, Food and Nutrition in Business, Fashion in Retailing and Business, Secondary Education and Extension and Nursery School Education. These are found under the specialized areas of Food and Nutrition, (FN); Textiles, Clothing and Related Arts, (TCRA); and Home Economics Education, (HEEd.). The subject matter areas of Management and Family Economics (MFE), and Human Development (HD), are supportive to the majors. The letters in parenthesis are area codes. Prerequisites of appropriate arts and science courses allow for application of fundamental knowledge to the content of courses in specialized areas. Course content is based on research in Home Economics as well as in the physical and biological sciences, social sciences, arts and humanities. These curricula, providing a minimum of sixty credits of liberal education, conform to the university requirements for a B. S. degree, and include a School of Home Economics core of nine credit hours, a core for each major area and a range from 120 to 128 credit hours for graduation.

Professional home economists are college and university graduates with bachelor degrees in Home Economics. They serve individuals, families and communities through schools and colleges, extension programs, business organizations of many kinds all over the world, community and government organizations and agencies, newspapers, magazines, radio and television. Representative types of activities that Home Economists participate in include teaching, research, writing, dietetics, extension work, interior decoration, fashion merchandising, food consulting, food service management and product development. Experience and advanced study in areas of specialization lead to positions of great responsibility.

FOOD AND NUTRITION

Food and Nutrition offers curricula which provide a strong foundation in the arts and sciences to support basic courses in foods and nutrition under two options: Dietetic and Institutional Administration and Food and Nutrition in Business.

Dietetic and Institutional Administration

The curriculum prepares the graduate for positions as staff and administrative dietitians in various types of food service; nutritionists with schools, Public Health and social welfare agencies and teaching and research dietitians. The sequence offers opportunities for further work at the graduate level. This program is planned to meet the basic requirements of the American Dietetic Association for admission to approved dietetic internships or other on-the-job training programs.

Major in Dietetic and Institutional Administration

	Credits		*Credits*
General Education	60	Professional	25
Home Economics Core	9	Electives	15
Semi-Professional (incl. Gen. Ed.)	15	Physical Education	
		Credits	124

I. *General Education*	*Credits*
English 1 and 2, Composition	4
English 25 and 26, Masterpieces of Western Literature	6
Speech 3, Oral Communication	2
Economics 25, Elements of	3
Sociology 25, Introductory	3
Psychology I, General	3
History 5, 6, 25, or 26, *or* Government 25, 26, 51, 52, 61, 62, or 66	3
Chemistry 1 and 2, General	6
Chemistry 33, Organic	4
Chemistry 79, Elementary Biochemistry	4
Zoology 1, Introductory	3
Zoology 35, Vertebrate Physiology	3
Microbiology 31, Introductory	4
Mathematics 1, Introductory	3
Accounting 25, Introduction to Accounting	3
Limited Electives — to be selected from the following areas: Music, Art, Speech, Anthropology, Philosophy, or Language	6
II. *Home Economics Core*	
FN 27, Man and Nutrition	3
Select two from remaining three core courses: TCRA 21, Man and Clothing; TCRA 23, Art for Living; MFE 50, Family Management and Decision Making	6

III. *Semi-Professional*

FN 30, Food Science and Preparation	3
HEEd. 81, Adult Education in Home Economics	3
Limited Electives — to be selected from the following sequence:	
MFE 74, Consumer Attitude and Demand	
MFE 77, Theory and Application of Management	
Public Health 61 or 62, Environmental Health	
Economics 79, Labor Problems	
Horticulture 74, Merchandising of Perishables, *or*	9
Honors	6
Research Problems	3

IV. *Professional*

FN 51, Meal Management	3
FN 91, 92, Institutional Administration	8
FN 52, Advanced Nutrition and Dietetics	3
FN 89, Nutrition in Disease	3
FN 94, Experimental Foods	3
Management 64, Personnel Management	3
FN 95, Seminar in Institutional Administration or Foods	1
FN 96, Seminar in Nutrition	1
Electives	15

Food and Nutrition in Business

This curriculum is based on professional training in Food and Nutrition combined with selected courses in the humanities, social sciences and business. The program is designed for the student who is oriented to the business world, and leads directly into product development, research or consumer services with food, equipment, and utility industries. Positions are open in the field of communications for the student who combines her knowledge of Food and Nutrition with Journalism, English, Public Speaking, Television and Radio. Graduates with a major in this sequence are also placed in advertising and public relations agencies or with consulting firms. This curriculum allows students to pursue graduate study.

Major in Food and Nutrition in Business

	Credits		*Credits*
General Education	65	Professional	23
Home Economics Core	9	Electives	15
Semi-Professional (incl. Gen. Ed.)	16	Physical Education	8
		Credits	128

I. *General Education*

	Credits
English 1 and 2, Composition	4
English 25 and 26, Masterpieces of Western Literature	6
Speech 3, Oral Communication	2
Speech 51, Public Speaking	3
Philosophy 25, Introductory *or* 31, Intro. Logic and Scientific Method *or* 42, Ethics *or* 82, Aesthetics	3

Journalism 51, Intro. to Mass. Communications	3
Psychology I, General	3
Economics 25, Elements of	3
Food Economics 65, Food Merchandising	3
Food Science 51, Introductory	3
Sociology 25, Introductory	3
Government 25, American *or* Government 66, American Political Thought	3
Chemistry 1 and 2, General	6
Chemistry 33, Organic	4
Mathematics I, Introductory	3
Zoology 1, Introductory	3
Zoology 35, Vertebrate Physiology	3
Microbiology 31, Introductory	4
Art 31, Basic Design	3
II. *Home Economics Core*	
FN 27, Man and Nutrition	3
TCRA 23, Art for Living	3
MFE 50, Family Management and Decision Making	3
III. *Semi-Professional*	
MFE 75, Personal and Family Economics	3
MFE 77, Theory and Application of Management	3
Marketing 53, Marketing Principles	3
Marketing 62, Marketing Research	3
Chemistry 79, Elementary Biochemistry*	4

*Those interested in Utility work substitute Marketing 54, Salesmanship & Sales Management.

IV. *Professional*	
FN 30, Food Science and Preparation	3
FN 51, Meal Management	3
FN 52, Advanced Nutrition and Dietetics*	3
HEEd. 61, Communication by Demonstration Methods	3
FN 92, Quantity Food Preparation	4
FN 94, Experimental Foods	3
MFE 74, Consumer Attitudes and Demand	3
FN 95, Seminar in Foods	1
Electives	15

*Substitute FN 73, Nutrition During Growth and Development for Utility work.

TEXTILES, CLOTHING AND RELATED ARTS

A field of specialization in this area is entitled Fashion in Retailing and Business. The retailing and professional opportunities associated with clothing, textiles, home furnishings and related merchandise are limitless. They include positions with manufacturers, producers, retailers, buying organizations, newspapers and magazines, radio and TV, consumer groups as well as educational institutions and social and government agencies. The student who is interested in the business field can get, by specializing in this area, a curriculum with a strong program of liberal arts with emphasis on the social sciences. Courses which build on this base toward professional business competency include fundamentals of clothing, textiles, fashion and related arts as well as courses in business, retailing and related subjects.

Major in Fashion in Retailing and Business

	Credits		*Credits*
General Education	60	Professional	22
Home Economics Core	9	Electives	6
Semi-Professional (incl. Gen. Ed.)	25	Physical Education	8

Credits 125

	Credits
I. *General Education*	
English 1 and 2, Composition	4
Speech 3, Oral Communication	2
English 25 and 26, Masterpieces of Western Literature	6
Foreign Language or Proficiency	12
Mathematics I, Introductory	3
Physical or Biological Science — 3 Sciences *or* 2 Sciences and Math II	9
Sociology 25, Introductory	3
Psychology I, General	3
Economics 25, Elements of	3
Economics 55, Consumption and Personal Finance	3
Limited Electives, one from each following sequence:	12
Philosophy 25, 42, 82	
Government 25, 66	
Sociology 59	
Psychology 62, 79	
II. *Home Economics Core*	
TCRA 21, Man and Clothing	3
TCRA 23, Art for Living	3
FN 27, Man and Nutrition *or* MFE 50, Family Management and Decision Making	3
III. *Semi-Professional*	
TCRA 28, Fundamentals of Clothing Const. *or* TCRA 53, Advanced Clothing Construction	3
TCRA 24, Textiles I	3
TCRA 86, Textiles II*	3
TCRA 65, Apparel Design and Selection*	3
TCRA 66, Apparel & Home Furnishing Accessories	3
TCRA 76, History of Decorative Arts*	3
TCRA 79, Interior Design*	3
TCRA 85, Fashion Industries	4
TCRA 88, Advanced Interior Design*	3
HEEd. 61, Communication by Demonstration Methods	3
* Elective Courses	
IV. *Professional*	
TCRA 42, Fashion in Retailing and Business	3
Marketing 53, Principles	3
Marketing 71, Retailing Principles	3
MFE 74, Consumer Attitudes and Demand	3
TCRA 93, Retailing Field Experience	6
TCRA 95, Seminar in Fashion in Retailing & Business	1
TCRA 97 or 98, Problems in Fashion in Retailing and Business	3
Electives	6

HOME ECONOMICS EDUCATION

Home Economics Education offers curricula which provide a broad cultural education and preparation for teaching under two options: Secondary Education and Extension; and Nursery School Education.

Secondary Education and Extension

The School of Home Economics, in cooperation with the School of Education, prepares students for teaching Home Economics in junior and senior high schools. Students interested in Home Economics Extension, with the aid of an extension adviser, select courses that prepare them for continuing education positions in extension in both adult and 4-H programs. This curriculum provides basic training for graduate work in the field of home economics teaching and extension.

Major in Secondary Education and Extension

	Credits		*Credits*
General Education	61	Professional	34
Home Economics Core	9	Electives	9
Semi-Professional (including Gen. Ed.)	15	Physical Education	8
		Credits	128

		Credits
I.	*General Education*	
	English 1 and 2, Composition	4
	English 25 and 26, Masterpieces of Western Literature	6
	Speech 3, Oral Communication	2
	Speech 50, Voice & Diction & Oral Interpretation *or* English 51, Advanced Expository Writing	3
	Sociology 25, Introductory	3
	HD 80, Human Development in the Family	3
	Psychology I, General	3
	Psychology 56, Educational	3
	Psychology 66, Adolescent	3
	History 25 and 26, America	6
	Philosophy 25, 31, 42, or 51	3
	Government 25, 52, 53, 56, 63, 66, or 72	3
	Economics 25, Elements of	3
	Chemistry 1 and 2, General	6
	Chemistry 33, Organic	4
	Mathematics I, Introductory	3
	Sociology 51, 52, 59, 75 *or* Economics 26, 53, 55	3
II.	*Home Economics*	
	FN 27, Man and Nutrition	3
	TCRA 23, Art for Living	3
	MFE 50, Family Management and Decision Making	3
III.	*Semi-Professional*	
	Education 51, History of Education	3
	Education 52, Principles and Methods of Teaching	3
	FN 30, Food Science and Preparation	3
	TCRA 24, Textiles I	3
	TCRA 28, Fundamentals of Clothing Construction *or* TCRA 21, Man and Clothing	3

IV. *Professional*

HEEd. 82, Curriculum in Home Economics	3
Ed. 85, Observation and Student Teaching	6
FN 51, Meal Management	3
FN 73, Nutrition During Growth and Development	3
TCRA 53, Advanced Clothing Construction	3
TCRA 65, Apparel Design and Selection	3
TCRA 79, Interior Design	3
MFE 75, Personal and Family Economics	3
HEEd. 61, Communication by Demonstration Methods	3
MFE 77, Theory and Application of Management	3
HEEd. 95, Seminar in Home Economics Education	1
Electives	9

Nursery School Education

Students in this option participate in a program of academic studies which are interdisciplinary in nature. This program brings together knowledge from psychology, sociology, education, the arts, biology, anthropology, and relates it to the study of human development and early childhood education. Directed experience with the children of the laboratory nursery school and their families provides the necessary opportunity for students to develop a sound personal philosophy of early childhood education, and to achieve competence in implementing it. More intensive specialization for qualified students may be obtained through the election of a one-semester affiliation with: (1) Merrill-Palmer Institute in Detroit, Michigan, which specializes in the study of human development and family life: (2) the Eliot-Pearson School in Boston, Massachusetts, which specializes in the education of the three- to six-year-old child.

The nursery school education program prepares the student for work in various types of group programs serving children of three and four years, such as laboratory nursery schools, public and private nursery schools, specialized nursery schools associated with clinics for exceptional children, hospital recreation programs, and nursery school programs in children's residential institutions. In addition, the nursery school education curriculum provides a good background for graduate work in various other child-serving professions.

Major in Nursery School Education

	Credits		*Credits*
General Education	60	Professional	28
Home Economics Core	9	Electives	15
Semi-Professional (including Gen. Ed.)	9	Physical Education	8
		Credits	121

I. *General Education*

	Credits
English 1 and 2, Composition	4
English 25 and 26, Masterpieces of Western Literature	6
Speech 3, Oral Communication	2
Zoology 1, Introductory	3
Zoology 35, Vertebrate Physiology	3

Sociology 25, Introductory	3
Psychology I or II, General	3
Economics 25, Elements of	3
Government 25, 52, 53, 56, 63, 66, or 72	3
Math. 1, Introductory	3
Philosophy 25, 31, 42, 51, 72, or 82	3
Science Elective	3
English 51, or Speech 50, 91, 92, or 93	3
Foreign Language or proficiency	12
(if proficiency in language is accomplished before the completion of 12 credits, electives taken in place of the language are to be chosen from a selected list of courses from the following areas: Zoology, Psychology, Speech, Sociology and Anthropology, Recreation and Physical Education, Education, and Public Health)	
Limited Electives	6
To be chosen from the Following areas: Anthropology, Art, Biological Sciences, Economics, Education, English or American Literature, History, Home Economics (core only), Music, Physical Sciences	
II. *Home Economics Core*	
FN 27, Man and Nutrition	3
TCRA 23, Art for Living	3
MFE 50, Family Management and Decision Making	3
III. *Semi-Professional*	
Anthropology 63, Social Anthropology	3
Statistics 21, Elementary — *or*	
Statistics 50, Psych. Section	3
Limited Elective (from Psychology, Sociology, Zoology, Recreation, Physical Education, Education, Public Health, Speech)	3
IV. *Professional*	
HD 70, Child Development	3
HD 80, Human Development in the Family	3
Music 85, Music Education — Music for the Elementary School Teacher	3
HEEd. 63, Art Activity in Recreation	3
HD 83, 84, Nursery School Management	6
FN 73, Nutrition During Growth and Development	3
Psychology 83, Abnormal Psychology	3
HD 95, 96, Seminar in Human Development	1
HD 97, 98, Problems in Nursery School Management	3
Electives	15

SCHOOL OF HOME ECONOMICS

Dean: Professor Marion A. Niederpruem. Professor Burroughs; Associate Professors Cook, D. Davis, V. Davis, Hawes, Merchant, Nichols, Rust; Assistant Professors Knapp, Lojkin, McCullough, Sullivan, Troxell; Mrs. Arnold, Miss Banks, Mesdames Jarvesoo, Johnson, Myers.

FOOD AND NUTRITION (FN)

27. (I) (II) Man and Nutrition

Fundamentals of the science of nutrition and its role in everyday life. Overview of the development of man's food habits encompassing psychological, social, economic and racial factors. 3 class hours. Credit, 3. Mrs. Cook.

30. (II) Food Science and Preparation

Fundamental scientific principles and comparative methods of food preparation. Prerequisite, Chemistry 33, or consent of chairman. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss D. Davis.

41. (I) Nutrition and Food Preparation

Combines the fundamentals of nutrition with food preparation and meal planning to meet nutritional requirements. For student nurses whose responsibility will be mostly with their patients. Registration by permission of the instructor. Prerequisites, Chemistry 1 and 2, Zoology 37. 2 class hours. 1 3-hour laboratory period. Credit, 3. Mrs. Cook, Mrs. Johnson.

51. (I) Meal Management

Consideration is given to money, time and energy expenditures and personal satisfactions in line with individual food requirements. The planning of meals according to the modern concepts of food preparation. Prerequisite, FN 30. 2 class hours, 1 3-hour laboratory period. Credit, 3. Miss D. Davis.

52. (II) Advanced Nutrition and Dietetics

Absorption, utilization and interrelationship of food nutrients. Evaluation of factors that influence nutrient requirements. Critique of methods of determining nutrient requirements. Prerequisites, FN 27, 51, Chemistry 79, Zoology 35 or equivalent. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mrs. Cook, Miss Rust.

56. (I) and (II) Principles of Food Preparation and Meal Planning

A survey course designed for non-major men and women. Basic food principles, food preparation and meal planning are emphasized. Reference to consumer food buying problems is included. 2 class hours, 1 3-hour laboratory period. Credit, 3. Miss D. Davis, Mrs. McCullough.

72. (II) Quantity Food Purchasing

A study of food distribution processes as they influence the purchase of food (cereal, dairy and meat products, fruits and vegetables, and fish) at the quantity or institutional level. Prerequisites, Accounting 25 or equivalent, Economics 25. 3 class hours. Credit, 3. Mrs. McCullough, Coordinator.

73. (I) Nutrition During Growth and Development

Nutrition as it affects physical growth and development from prenatal through adolescence. Criteria for judging and studies of nutritional status of children. Opportunity for laboratory work in the Nursery School. Prerequisites, FN 27 or 52. 3 class hours. Credit, 3. Mrs. Cook.

89. (I) Nutrition in Disease

Physiological basis for the use of therapeutic diets in certain diseases. Current medical and nutrition literature used. Prerequisites, FN 52, Chemistry 79, Zoology 35 or equivalent. 3 class hours. Credit, 3. Mrs. Cook.

91. (I) Institutional Administration

Principles of organization, personnel management, sanitation, food service planning and equipment selection. Field trips in the area. Prerequisites, FN 51 or 56. 2 class hours, 1 4-hour laboratory period or field trip. Credit, 4. Mrs. McCullough.

92. (II) Quantity Food Preparation

Experience in use of large equipment and application of principles of quantity food preparation, service and cost control. University Dining Hall and Amherst School Lunch Program utilized. Prerequisites, FN 30, FN 51 or Food Management 33. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mrs. McCullough.

94. (II) Experimental Foods

Investigation of experimental techniques and advanced knowledge related to the chemistry of food preparation. Original research projects included. For those interested in dietetics, food and nutrition in business or non-majors interested in foods. Prerequisites, FN 30 and 51; and/or Chemistry 33 or Chemistry 51 and 52, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Miss D. Davis.

95. (1) (I) Seminar in Foods

Readings and discussions of foods based on the scientific literature. Designed primarily as a Senior course for majors in Food and Nutrition. Prerequisites, FN 30 and 51, or permission of instructor. 1 class hour. Credit, 1. Miss D. Davis.

95. (2) (I) Seminar in Institutional Administration

1 class hour. Credit, 1. Mrs. McCullough.

96. (II) Seminar in Nutrition

Individual reports and discussion of current research in nutrition. To be taken Senior year. Prerequisites, FN 27 or 52. 1-2 class hours. Credit, 1. Mrs. Cook.

97. (I) 98. (II) Problems in Foods, Nutrition or Institutional Administration

An intensive study of some phase of foods, nutrition or institutional administration. By permission of the staff adviser. Credit, 1-3. Staff.

TEXTILES, CLOTHING AND RELATED ARTS (TCRA)

21. (I) Man and Clothing

The impact of clothing and textiles, its sociological, psychological and economic implications to the individual and society, seen in historic and contemporary perspective. Prerequisites, Sociology 25, Psychology 1, Economics 25, or by permission of instructor. 3 class hours. Credit, 3. Miss V. Davis.

23. (I) Art for Living

Value identification and judgment through the study of design. Concepts basic to artistic expression. Illustrated lectures, field trips. 3 class hours. Credit, 3. Mrs. Jarvesoo.

24. (II) Textiles I

Introductory study of fibers, fabrics, finishes, quality, care and performance of textile products and their role in the economic and cultural development of society. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Hawes.

28. (II) Fundamentals of Clothing Construction

Fundamental principles of garment construction as a form of artistic expression from grain perfection to quality product with emphasis on accuracy, fit and finishing. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Miss Hawes.

42. (II) Fashion in Retailing and Business

A study of the retailing and professional opportunities associated with clothing, textiles, home furnishings and related merchandise. Analysis of the function of retailing, types of retail organizations and their internal organizations. Four field trips on scheduled Saturdays. Prerequisite, Economics 25 and consent of chairman. 3 class hours. Credit, 3. Staff.

53. (I) Advanced Clothing Construction

Principles and practices of clothing construction. Emphasis on study of patterns and problems of fitting. Opportunities for students to create original designs. Prerequisite, TCRA 28 or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mrs. Jarvesoo.

65. (I) Apparel Design and Selection

A comprehensive study of the development of individual expression and the attainment of satisfactions in men's, women's and children's apparel through an understanding and adaptation of basic knowledge of selection and design. Prerequisites, TCRA 23, or permission of instructor, Psychology 1 or Sociology 25. 3 class hours. Credit, 3. Staff.

66. (II) Apparel and Home Furnishings Accessories

Materials, manufacturing processes, resources and markets of apparel and home furnishing accessories. Quality differences and essential selling information in ceramics, glassware, metals, jewelry, leathers, furs, plastics and furniture. 2 class hours, 1 2-hour laboratory period. Credit, 3. Staff.

76. (II) History of Decorative Arts

A study of style periods in historic context — their aesthetic contributions. Emphasis on developments in western dress, furniture and furnishings. Illustrated lectures. Study tours. Prerequisite, TCRA 23, or by permission of instructor. 3 class hours. Credit, 3. Mrs. Jarvesoo.

78. (II) Applied Textile Design

A creative approach to textile art. Original designing which emphasizes principles of organization. Application to heighten the understanding in techniques and media. Prerequisites, TCRA 23, or Art 31, or by permission of the instructor. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mrs. Jarvesoo.

79. (I) Interior Design

Principles in coordinating furnishings, backgrounds, accessories, color, lighting, etc. to interior designs. Prerequisite, TCRA 23. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mrs. Jarvesoo.

85. (I) Fashion Industries

Organization and structure of fashion industries in primary and regional markets producing ready-to-wear and apparel accessories. Factors affecting designing, production, distribution and consumption of clothing. Emphasis on the promotion process in fashion merchandising. Prerequisites, Marketing 71. 4 class hours. Credit, 4. Miss V. Davis.

86. (II) Textiles II

Concentrated study and evaluation of recent scientific and technical developments in fibers and finishes affecting appearance, performance, care and cost. Prerequisite, TCRA 24. 3 class hours. Credit, 3. Miss Hawes

TCRA 88. (II) Advanced Interior Design

A creative study of architectural space. Rendering of interiors with emphasis on translating textures and effect. Advanced studies in perspective. Prerequisites: TCRA 23, 79, Art 51, or equivalent. 1 class hour, 2 2-hour studio periods. Credit, 3. Staff.

93. (I) Retailing Field Experience

A 7-8 weeks off-campus supervised and coordinated training-work program in a cooperating department store. Experience in selling supervision or merchandising followed by evaluation of training, work experience, leadership development and individual progress. Prerequisites, Marketing 71, TCRA 42, 24, 66, 6-8 weeks selling experience, and permission of instructor. Credit, 6. Blocked senior year. Staff.

95. (I) 96. (II) Seminar in Fashion in Retailing and Business

Review of current literature or discussion of selected topics. Credit, 1. Staff.

97. (I) 98. (II) Problems in Fashion Retailing and Business

Planning, developing and executing a survey or study of special interest to the student in the areas of retail store operations or management, clothing consumption patterns, consumer clothing problems or related topics. Prerequisites, TCRA 42, Marketing 71. Credit, 1-3. Staff.

HOME ECONOMICS EDUCATION (HEEd)

61. (I) Communication by Demonstration Methods

The developing and selling of an idea through the medium of demonstration as applied to education and promotional work. The building of individual confidence is stressed. Prerequisites, Speech 3, 6 credits in major area, or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Miss D. Davis.

63. (I) Art Activity in Recreation

Stresses creative growth of the individual. Adapted for those working in schools, playgrounds, camps, in recreational leadership and occupational therapy. Prerequisite, Psychology 1. 2 class hours, 1 2-hour laboratory. Credit, 3. Mrs. Sullivan.

81. (I) Adult Education in Home Economics

Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement. Prerequisite, minimum 6 credits in major area. 2 class hours, 1 2-hour laboratory. Credit, 3. Mrs. Sullivan.

82. (II) Curriculum in Home Economics

Organization, scope and sequence of learning experiences in home economics education at secondary level. Philosophy and content of curriculum, development of resource units. Prerequisites, Psychology 56 and 66, Education 51. 2 class hours, 1 2-hour laboratory. Credit, 3. Mrs. Sullivan.

95. (I) Seminar in Home Economics Education

1 class hour. Credit, 1. Mrs. Sullivan.

97. (I) 98. (II) Problems in Home Economics Education

An intensive study of some phase of home economics education. Credit, 1-3. Staff.

MANAGEMENT AND FAMILY ECONOMICS (MFE)

50. (II) Family Management and Decision Making

Management and Decision Making in the Family. A presentation of the integrated nature of home management; concerns values and goals as reflected in decision making about family resources. 3 class hours. Credit, 3. Miss Nichols.

60. (II) Household Equipment

Physical principles, construction, materials and economic considerations underlying the selection, use and care of household equipment. 2 class hours, 1 2-hour laboratory period. Credit, 3. Staff.

74. (II) Consumer Attitudes and Demand

Study of the motives, attitudes and expectations of consumer behavior as influencing variables operating within and on the market. Prerequisites, Economics 25, Psychology 1, Sociology 25, or by permission of the instructor. 3 class hours. Credit, 3. Miss Merchant.

75. (I) Personal and Family Economics

Analysis of financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society. Prerequisite, Economics 25, or by special permission of instructor. 3 class hours. Credit, 3. Mr. Knapp.

77. (I) (II) Theory and Application of Management

Theory and application of principles of effective home management. Problem-solving program applied to theoretical and practical situations in the home. Prerequisites, MFE 50. Junior or Senior standing. 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Nichols.

HUMAN DEVELOPMENT (HD)

70. (I) (II) Child Development

The study of the child from the developmental point of view. Emphasis is on interaction of heredity and environment on development. Planned observation in the Nursery School. Prerequisites, Sociology 25, Psychology 1. 3 class hours, 1 1-hour laboratory period. Credit, 3. Mrs. Myers.

80. (II) Human Development in the Family

The family as the dynamic setting for the development of the human being from conception to senescence, with consideration of roles and relationships at the various developmental stages. Prerequisites, Psychology 1 and Sociology 25. 3 class hours. Credit, 3. Mr. Burroughs.

83. (I) Nursery School Management

Principles and methods of nursery school education. Directed experience in teaching and curriculum planning for three- and four-year-old children. Field trips. Prerequisites, HD 70 or equivalent. 2 class hours, 1 3-hour laboratory period. Credit, 3. Miss Banks.

84. (II) Nursery School Management

Continuation of 83. Prerequisite, HD 83, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Miss Banks.

95. (I) Seminar in Human Development

Prerequisite, HD 70 or 80. 1 class hour. Credit, 1. Staff.

97. (I) 98. (II) Problems in Nursery School Education

An intensive study of some phase of Nursery School Education. By permission of staff adviser. Credit, 1-3. Staff.

SCHOOL OF NURSING

MARY A. MAHER, *Dean*

Mary E. Macdonald, *Associate Dean*

The basic nursing program is designed to prepare the qualified high school graduate for a career in professional nursing, as well as for the responsibilities of family and community life.

The program aims to equip the graduate with those understandings and skills which are needed to function effectively in beginning positions in a variety of nursing situations. These include the ability to provide competent nursing care to patients and families in the hospital, home and community; to participate with allied professional and citizen groups for the improvement of total health services to individuals and communities; to participate in organizing, planning and directing the work of nursing auxiliary workers. A foundation is laid for advanced study, through which the nurse may prepare for positions in a clinical specialty, teaching, supervision, administration, consultation and research.

During the first two years, the student builds an educational foundation upon which to base the more specialized portion of the program. Courses in the humanities and in the sciences — biological, physical and behavioral — are taken with other students on the campus.

The clinical aspects of the program are developed in the next two years, when instruction and correlated clinical practice are given in selected cooperating agencies by the nursing faculty of the University and the allied professional staffs of the cooperating agencies. These agencies include: the Springfield Hospital; the Wesson Maternity Hospital, Springfield; the Wesson Memorial Hospital, Springfield; the Northampton State Hospital; Springfield Adult Mental Health Center; the Visiting Nurse Association of Springfield, the Springfield Health Department; and other community health, educational and welfare resources.

The Bachelor of Science degree, awarded upon successful completion of this program, qualifies the graduate for State Board Examinations in Nursing. If achievement in these examinations is satisfactory, the candidate receives legal status as a registered nurse within the state.

The program is fully accredited by the Accrediting Service of the National League for Nursing.

PROGRAM SEQUENCE

FIRST YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, English Comp.	2	English 2, English Comp.	2
Chemistry 1, General	3	Chemistry 2, General	3
Zoology 1, Introductory	3	Psychology 1, General, or Sociology 25, Introduction	3
Psychology 1, General, or Sociology 25, Introduction	3	Elective*	3
Elective*	3	Speech 3**, Public Speaking	2
Speech 3**, Public Speaking	2	Nursing 1, Introduction	3
Physical Education 1a, b †	2	Physical Education 2a, b †	2

* Elective chosen from: History, Government, or Economics. Students wishing to elect a foreign language may do so providing the basic requirement of the six elective credits indicated above is fulfilled. If a language is elected, intermediate proficiency is required.

** May be taken either semester.

† Not quality point credit.

SECOND YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Masterpieces of Western Literature	3	English 26, Masterpieces of Western Literature	3
Microbiology 1, Introduction	4	Chemistry 33, Organic	4
Zoology 37, Human Anatomy & Physiology	4	Zoology 38, Human Anatomy & Physiology	4
Food & Nutrition 41, Nutrition & Food Preparation	3	Human Development 80, Human Development in the Family	3
Nursing 25, Fundamentals of Nursing I	3	Nursing 26, Fundamentals of Nursing II	3
Physical Education 31a, b*	2	Physical Education 32a, b*	2

* Not quality point credit.

THIRD YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Nursing 51, Nursing of Child & Adult in the Hospital I	7	Nursing 53, Nursing of Child & Adult in the Hospital II	7
Nursing 52, Nursing of Child & Adult in the Hospital & Community	7	Nursing 54, Nursing of Child & Adult in the Hospital III	7
Elective*	3	Elective*	3

* Elective chosen from Behavioral Sciences.

FOURTH YEAR*

1st Semester	*Credits*	*2nd Semester*	*Credits*
Nursing 55, Maternal and Infant Nursing	7	Nursing 58, Nursing of Child & Adult in the Hospital IV	7
Nursing 57, Nursing in the Community	7	Nursing 60, Management in Nursing Care	7
Nursing 95, Seminar	2	Nursing 96, Seminar	2
Elective**	3	Elective***	3

* Clinical nursing courses listed will be taken during first *or* second semester, depending on clinical rotation of individual student.

** Humanities Elective: Art, English Literature, Foreign Language Literature, Music, Philosophy.

*** Elective: Student will be guided in her selection by her major advisor.

SCHOOL OF NURSING

Dean: Professor Mary A. Maher; Professors Gilmore, Macdonald; Associate Professor DiMaggio; Assistant Professors Byrne, Condron, Crowley, Walker; Miss Cahill, Miss Hall, Miss Mather, Miss Wieners.

1. (II) Introduction to Nursing

Designed to assist the individual student in her personal and professional adjustment to nursing. Enrollment limited to students of nursing. Credit, 3. Miss Crowley, Miss Macdonald.

25. (I) Fundamentals of Nursing I

Aims at the acquisition of beginning knowledge and skills considered basic to an effective nurse-patient relationship. Selected experiences in the nursing care of the hospitalized adult are provided. Prerequisite, Nursing I. Credit, 3. The Clinical Nursing Faculty. Miss Macdonald.

26. (II) Fundamentals of Nursing II

A continuation of Nursing 25. Prerequisite, Nursing 25. Credit, 3. The Clinical Nursing Faculty, Miss Macdonald.

51. (I) Nursing of Child and Adult in the Hospital I

Through a study of selected health problems of children and adults in a general hospital, the student acquires beginning competence and judgment necessary to administer comprehensive nursing care. Prerequisite, Nursing 26. 10 class hours, 15 clinical nursing laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. The Clinical Nursing Faculty, Medical, Pediatric and Allied Professional Staffs of the Springfield Hospital and other Health Agencies.

52. (I) Nursing of Child and Adult in the Hospital and Community

The components of community health are studied and related to the major health problems, programs and services of a specific community. Experience includes participation in the nursing care of selected hospitalized and non-hospitalized patients. Prerequisite, Nursing 51. 10 class hours, 15 nursing laboratory hours, 2 conference hours for 8 weeks. Credit 7. The Clinical Nursing Faculty, Miss Maher, Miss Macdonald, Medical and Allied Professional Staffs of the Springfield Hospital and other Community Agencies.

53. (II) Nursing of Child and Adult in the Hospital II

A continuation of Nursing 51. Includes an introduction to the role of the nurse in the treatment and prevention of mental illness. Clinical experience includes participation in the nursing care of children and adults with medical, surgical and psychiatric problems. Prerequisite, Nursing 52. 10 class hours, 15 clinical nursing laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital and the Northampton State Hospital.

54. (II) Nursing of Child and Adult in the Hospital III

A continuation of Nursing 53. Clinical experience includes participation in the nursing care of children and adults with medical, surgical and psychiatric problems. Prerequisite, Nursing 53. 10 class hours, 15 clinical nursing laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital and the Northampton State Hospital.

55. (I) (II) Maternal and Infant Nursing

A study of the health needs of the mother and newborn infant throughout the maternity cycle. Clinical experience includes participation in the nursing care of mothers and infants in the home, out-patient department, hospital, and child health conference. Prerequisite, Nursing 56. 10 class hours, 15 laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. Maternal-Child Health-Public Health Nursing Faculty, Obstetrical, Pediatric, and Allied Professional Staffs of the Wesson Maternity Hospital and other Health and Community Agencies.

57. (I) (II) Nursing in the Community

The philosophy, purpose and scope of public health and public health nursing. An introduction to public health science is taught concurrently with principles and practices of public health nursing. Nursing practice, planned concurrently, includes experiences with selected individuals, families, and groups served by an official and non-official public health nursing service. Prerequisite, Nursing 55. 8 class hours, 22 field practice hours for 8 weeks. Credit, 7. Miss Byrne, Mr. Wisnieski, The Clinical Nursing Faculty, and the Professional Staffs of the Visiting Nurse Association of Springfield, the Springfield Health Department, and other Health Agencies.

58. (I) (II) Nursing of Child and Adult in the Hospital IV

A continuation of Nursing 56. Includes participation in the nursing care of hospitalized children and adults with multiple health problems. Prerequisite, Nursing 56. 10 class hours, 15 clinical nursing laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital, the Northampton State Hospital, The Springfield Adult Mental Health Center, and other Health Agencies.

60. (I) (II) Management in Nursing Care

The principles of management, as related to the nursing care of patients in a hospital nursing unit, are emphasized. Clinical experience includes participation as a member and co-leader of the nursing team. Prerequisite, Nursing 58, 95: Nursing 95 may be taken concurrently. 10 class hours, 15 clinical nursing laboratory hours, 2 clinical conference hours for 8 weeks. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital.

95. (I) Seminar

A seminar in which the principles of management as applied to the nursing care of patients are studied. Enrollment limited to senior students of nursing. 2 class hours. Credit, 2. Miss Macdonald.

96. (II) Seminar

A seminar on professional, social and historical foundations of nursing. Enrollment limited to senior students of nursing. 2 class hours. Credit, 2. Miss Macdonald.

97. (I) 98. (II) Special Problems

Guided reading and research in selected areas of nursing specialization. Includes introductory unit on role and process of research in nursing. For qualified Juniors and Seniors. Credit, 1-6. Staff.

SCHOOL OF PHYSICAL EDUCATION

W. P. McGUIRK, *Dean*

The School of Physical Education includes the Departments of Physical Education for Men, Physical Education for Women, Recreation and Athletics. It offers a major in Physical Education and in Recreation.

PHYSICAL EDUCATION FOR MEN

Head of Department: Professor S. W. Kauffman. Professors Briggs, Zunic; Associate Professors Bischoff, Garber, Ricci; Assistant Professors Bergquist, Cobb, James; Messrs. Barber, Beal, Brosky, Douglas, Gundersheim, Kjeldsen.

General Program

Each male freshman and sophomore student, unless exempted under certain conditions, must successfully complete four semesters of physical education and demonstrate his ability to swim as a requirement for his degree. The physical education requirement does not apply to those students excused by the University physician, veterans of military service, and certain transfer students. Students may receive credit for physical education, during the sport in season, by becoming squad members of any freshman or varsity team. Freshmen who elect an athletic team sport for physical education credit must rejoin their class sections at the termination of the seasonal sport. Students may not participate in a given sport for credit for more than two semester. To fulfill requirements, all students must participate in three team sports, four individual activities and aquatics.

Major Program

The major program leading to the degree of Bachelor of Science in physical education is designed to train the student for a career as a teacher of physical education. The curriculum combines both general and professional education and provides for full teacher certification for the student who has met the prescribed requirements of preparation. The program also provides for adequate training in a minor area of teaching, elected by the student, including the coaching of inter-school athletics.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
P. E. 23, Principles of Health Ed.	3	Speech 3	2
Statistics 21	3	Social Science Elective	3
P. E. 21, Intro. to Phys. Ed.	3	P. E. 22, First Aid and Safety	3
(Military or Air Science 11	1)	(Military or Air Science 12	1)
P. E. 5, Skills and Techniques (Lacrosse—Gymnastics)	1	P. E. 6, Skills and Techniques (Gymnastics—Badminton)	1
Elect One		*Elect One*	
Chemsitry 1	3	Chemistry 2	3
Botany 1	3	Botany 1	3
Zoology	3	Zoology 1	3
	16		15

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25	3	English 26	3
Zoology 35, Physiology	3	Microbiology 1	4
P. E. 41, Anatomy	3	P. E. 42, Kinesiology	3
Psych. 1, Gen. Psychology	3	Psych. 56, Educ. Psychology	3
P. E. 35, Skills and Techniques (Soccer—Wrestling)	1	(Aquatics)	
(Military or Air Science 25	1)	(Military or Air Science 26	1)
Humanities Elective	3	Electives	3
	17		17

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Rec. Ed. 77, Org. and Adm. of Comm. Recreation	3	Psych. 65, Child Psych.	3
P. E. 53, Phys. Ed. Elem. & Second. Sch.	3	P. H. 88, Epidemiology	3
P. E. 57, Coaching Baseball	1	P. E. 54, Methods of Phys. Ed.	1
P. E. 61, Coaching Basketball	1	P. E. 58, Coaching Track	1
P. E. 59, Adaptive Phys. Ed.	3	P. E. 60, Coaching Football	1
P. E. 63, Skills and Techniques (Baseball—Basketball)	1	P. E. 74, Tests and Msmts. in Phys. Ed.	3
Minor Electives	3-6	P. E. 64, Skills and Techniques (Game—Track)	1
		Minor Electives	3-6
	15-18		16-19

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ed. 52, Prin. and Meth. Teach.	3	Speech 51, Public Speaking	3
Ed. 88, Sec. Sch. Curriculum	3	P. E. 55, Org. & Adm. of Phys. Ed.	3
Ed. 85, Practice Teaching*	6	P. E. 76, Philos. and Prin. Phys. Ed.	3
P. E. 81, Adm. Intramural Programs	1	P. E. 78, Physiology of Exercise	3
P. E. 83, Skills and Techniques (Golf—Tennis)	1	P. E. 82, Coaching Soccer	1
		P. E. 84, Skills and Techniques (Rhythms)	1
	14	Minor Elective	3
			17

*Ed. 85 taken during last 8 weeks of semester. All other courses listed will be accelerated during the first 7 weeks of the semester.

PHYSICAL EDUCATION FOR MEN

The following courses with the exceptions of 1a, 1b, 2a, 2b, 31a, 31b, 32a and 32b are offered for majors in Physical Education. Non-major admission is only by permission of the Department.

1a, 1b (I) 2a, 2b (II) Physical Education

Aim of the course is to inculcate in the student an adequate knowledge of, a sufficient technique in, and a wholesome attitude toward physical education activities through the medium of individual, dual, and team sports. 3 class hours. Credit, 2. Not quality point credit.

5. (I) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) lacrosse. (Unit 2) apparatus gymnastics. 60 clock hours per semester. Credit, 1.

6. (II) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) tumbling and trampoling. (Unit 2) badminton. 60 clock hours per semester. Credit, 1.

21. (I) Introduction to Physical Education

Origins of physical education, fundamental concepts, current status in education, qualifications and professional opportunities in the field. 3 class hours. Credit, 3.

22. (II) First Aid and Safety

Materials applicable to the immediate care of the injured, causes of accidents and procedures designed to develop desirable safety practices. 3 class hours. Credit, 3.

23. (I) Principles and Practices in Health Education

Principles of personal and community health, teaching techniques, materials and resources. 3 class hours. Credit, 3.

31a, 31b (I) 32a, 32b (II) Physical Education

A continuation of Physical Education 1a, 1b, 2a and 2b. 3 class hours. Credit, 2. Not quality point credit.

35. (I) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) soccer. (Unit 2) wrestling. 60 clock hours per semester. Credit, 1.

36. (II) Skills and Techniques

Fundamental skills in life saving and water safety. Certification as American Red Cross Water Safety Instructor. 60 clock hours per semester. Credit, 1.

41. (I) Human Anatomy

A study of the gross structure and function of the human body. 2 class hours, 1 2-hour laboratory period. Credit, 3.

42. (II) Kinesiology

A study of the anatomical application basis to a thorough understanding of the mechanical problems in motor skills. Prerequisite, Physical Education 41. 2 class hours, 1 2-hour laboratory period. Credit, 3.

43. (I) Officiating

Techniques and practice in officiating major sports. 2 class hours, Credit, 2.

53. (I) Physical Education in Elementary and Secondary Schools

Modern materials and methods of teaching physical education in elementary and secondary schools. 3 class hours. Credit, 3.

54. (II) Methods of Physical Education

Laboratory experience in teaching individual, dual and team activities. Prerequisite, Psychology 56 or 65. Credit, 1.

55. (I) Organization and Administration of Physical Education

A study of the basic problems in the organization and administration of physical education. 3 class hours. Credit, 3.

57. (I) Methods and Materials: Coaching Baseball

Development of individual skills and techniques of teaching and coaching baseball. 2 class hours. Credit, 1.

58. (II) Methods and Materials: Coaching Track

Development of individual skills and techniques of teaching and coaching track. 2 class hours. Credit, 1.

59. (I) Adapted Physical Education

Programs of developmental activities, suited to the interests and capacities of students with disabilities restricted from participation in activities of the general physical education program. Prerequisite, Physical Education 42. 3 class hours. Credit, 3.

60. (II) Methods and Materials: Coaching Football

Development of individual skills and techniques of teaching and coaching football. 2 class hours. Credit, 1.

61. (I) Methods and Materials: Coaching Basketball

Development of individual skills and techniques of teaching and coaching basketball. 2 class hours. Credit, 1.

63. (I) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) baseball. (Unit 2) basketball. 60 clock hours per semester. Credit, 1.

64. (II) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) high and low organization games. (Unit 2) track and field. 60 clock hours per semester. Credit, 1.

74. (II) Tests and Measurements

The statistical interpretation of data and the practical application of measurement to physical education. 3 class hours. Credit, 3.

75. (I) Athletic Injuries—Prevention and Care

The medical examination, techniques in support methods, therapeutic aids, clinical use of physiotherapy equipment. Prerequisite, Physical Education 42. 2 class hours, 1 2-hour laboratory period. Credit, 2.

76. (II) Philosophy and Principles of Physical Education

Contemporary interpretations and critical analysis for the foundation of policies and program construction. 3 class hours. Credit, 3.

78. (II) Physiology of Exercise

Application of the basic physiological concepts of the program of physical education, emphasizing the physiological effects and adjustments accruing from participation in physical activity. Prerequisite, Physical Education 42. 2 class hours, 1 2-hour laboratory period. Credit, 3.

80. (I) and (II) Driver Education Instructor Course

Driver education and driver training at the instructor's level. Leads to certification as instructor in driver education and driver training. 2 class hours, 1 2-hour laboratory period. Credit, 3.

81. (I) Administration of Intramural Programs

Objectives, tourney design, organization and administration of intramural programs. 2 class hours. Credit, 1.

82. (II) Methods and Materials: Coaching Soccer

Development of individual skills and techniques of teaching and coaching soccer. 2 class hours. Credit, 1.

83. (I) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) tennis. (Unit 2) golf. 60 clock hours per semester. Credit, 1.

84. (II) Skills and Techniques

Fundamental skills and techniques of teaching. (Unit 1) dance. (Unit 2) rhythms. 60 clock hours per semester. Credit, 1.

97. (I) 98. (II) Special Problems Course

Presentation and discussion of research work in physical education, health, or athletics. 3 class hours. Credit, 3.

PHYSICAL EDUCATION FOR WOMEN

Head of Department: Professor Ruth J. Totman. Associate Professors Hubbard, Ogilvie, Riggs, Wallace; Assistant Professors Reid, Rupp, Vendien; Mrs. Archibald, Misses Irvine, Kilby, Roby,* Struzinsky, Upton.*

General Program

Physical Education is required of all women students during their freshman and sophomore years. The courses are planned to provide recreative activity, to improve individual skills, to develop body grace and efficiency and to increase health and vigor.

The first and second year women students are required to take three class hours a week for a total of eight credits, one for each quarter of satisfactory work.

Major Program

The major course in physical education is planned to prepare women students for professional careers. Especial attention is given to preparing teachers for elementary and secondary schools in both physical and health education. Other areas for which the graduate will qualify are teaching sports and dance in social agencies, industrial plants, civic centers and camps. A foundation will be laid for specialization in graduate study.

The curriculum gives a broad general background as well as the professional preparation. There is opportunity for individual selection in order to provide a minor.

*On leave.

Curriculum for Women's Physical Education

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
History 5	3	Speech 3	2
Psych. 1, General	3	History 6	3
W. P. E. 10, Health for Adults	2	Zoology 1	3
W. P. E. 1, Introduction to Physical Education	2	W. P. E. 2, Introduction to the Child through Physical Education	2
W. P. E. 11, Skills	1	W. P. E. 12, Skills	1
Select one	3	Select one	3

Chemistry 1 and 2 are required if students have not had chemistry in high school. Others may select from Chemistry, Physics, Microbiology or Foreign Language.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25	3	English 26	3
P. E. 41, Anatomy	3	Sociology 25	3
P. E. 22, First Aid & Safety	3	R. L. 26, Camp Counseling	3
W. P. E. 35, Skills	1	P. E. 42, Kinesiology	3
Music 29 or Art 14	3	W. P. E. 30, Aquatics	2
Elective	3	W. P. E. 36, Skills	1
		Elective	3

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
W. P. E. 73, History and Principles of Physical Education	3	P. E. 74, Tests and Measurements	3
Zoology 35	3	W. P. E. 70, Organization & Administration of Physical Education	3
W. P. E. 63, Analysis of Rhythm	3	Psych. 56, Educational	3
W. P. E. 53, Physical Education in Elementary Schools	3	W. P. E. 56, Methods & Principles of Health Education	3
W. P. E. 51, Skill & Teaching Methods	2	W. P. E. 52, Skills & Teaching Methods	2
Statistical	3	Elective	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Teaching Semester		Non-teaching Semester	
Ed. 52, Principles and Methods	3	W. P. E. 83, Adaptive Physical Education	3
Ed. 88, Secondary Schools	3	W. P. E. 96, Seminar	3
Ed. 85, Practice Teaching	6	P. E. 78, Physiology of Exercise	3
W. P. E. 61, Skills & Teaching Methods	2	W. P. E. 62, Skills & Teaching Methods	2
		Elective	6

PHYSICAL EDUCATION FOR WOMEN

1a. (1) Physical Education

Students are required to pass a safety test in swimming. Except for this requirement all unrestricted students may select any activity which is offered. Fall season: archery, field hockey, folk dance, golf, lacrosse, life-saving, modern dance, swimming, tennis, volleyball. 3 class hours. Credit, 1.

1b. (I) Physical Education

Winter I season: badminton, ballroom dance, basketball, body mechanics, bowling, diving, fencing, folk dance, gymnastics, life-saving, modern dance, swimming, synchronized swimming, tap dance, trampoline, volleyball. 3 class hours. Credit, 1.

2a. (II) Physical Education

Winter II season: same as in course 1b. 3 class hours. Credit, 1.

2b. (II) Physical Education

Spring season: archery, folk dance, golf, lacrosse, life-saving, modern dance, softball, swimming, synchronized swimming, tennis, volleyball. 3 class hours. Credit, 1.

5. (I) Introduction to Physical Education for Women

A brief survey of the various areas of physical education for all ages; the trends and opportunities in today's program. 2 class hours, 1 2-hour laboratory period. Credit, 2.

6. (II) Introduction to the Child Through Physical Education

A study of children as they take part in physical activities. 2 class hours, 1 2-hour laboratory period. Credit, 2.

10. (II) Health for Adults

Practical personal and community health problems for the consideration of young adults. 2 class hours. Credit, 2.

11. (I) Skills

Field hockey, tennis, gymnastics, swimming. 6 class hours. Credit, 1.

12. (II) Skills

Folk dance, basketball, golf, softball. 6 class hours. Credit, 1.

30. (II) Aquatics

Techniques unique in the teaching of aquatics including the American Red Cross courses. 2 class hours, 1 2-hour laboratory period. Credit, 2.

31a, 31b. (I) 32a, 32b. (II) Physical Education

The seasonal activities for sophomores are the same as in Courses 1a and 1b, 2a and 2b, with emphasis on perfecting techniques rather than learning the elementary skills. 3 class hours. Credit, 1.

35. (I) Skills

Archery, swimming, basketball officiating, dance. 6 class hours. Credit, 1.

36. (II) Skills

Dance, gymnastics, lacrosse, volleyball. 6 class hours. Credit, 1.

51. (I) Skills and Teaching Techniques

Soccer, speedball, hockey, tap dance, basketball. The chief emphasis will be on teaching techniques; however, improvement in skill will be stressed. 6 class hours. Credit, 2.

52. (II) Skills and Teaching Techniques

Gymnastics, ballroom dance, body mechanics. 6 class hours. Credit, 2.

53. Physical Education for Elementary Schools

Modern methods and material for teaching physical education in elementary grades. 2 class hours, 1 2-hour laboratory period. Credit, 3.

56. (II) Methods and Principles of Health Education for Elementary and Secondary Schools

To prepare students to teach health and hygiene in elementary and secondary schools. 3 class hours. Credit, 3.

61. (I) Skills and Teaching Techniques

Fencing, folk dance, badminton. 6 class hours. Credit, 2.

62. (II) Skills and Teaching Techniques

Dance, bowling, lacrosse. 6 class hours. Credit, 2.

63. (I) Analysis of Rhythm

The analysis of the rhythmic structure of music and its application to motor activity. 2 class hours, 1 2-hour laboratory period. Credit, 3.

70. (II) Organization and Administration

The organization of the school system, the role of the teacher, the necessary facilities and the program in physical education. 3 class hours. Credit, 3.

73. (I) History and Principles of Physical Education

A study of the principal methods of physical education throughout the western world and of the philosophical and scientific bases of learning and teaching as applied to physical education. 3 class hours. Credit. 3.

83. (I) Adaptive Physical Education for Women

The problems of exercise for girls who are restricted physically. 3 class hours. Credit, 3.

96. (II) Seminar

The opportunity for specialized study in a chosen area of physical education with emphasis on practical application. 3 class hours. Credit, 3.

PHYSICAL RECREATION

The following courses, taught jointly by the departments of Physical Education for men and Physical Education for women, are offered for majors in Recreation. Non-major admission is only by permission of the department.

13. (I) Skills and Techniques

Development of fundamental skills and methods of teaching and organizing groups for participation in badminton and basketball. 60 clock hours. Credit, 1.

14. (II) Skills and Techniques

Development of fundamental skills and methods of teaching and organizing groups for participation in games and archery. 60 clock hours. Credit, 1.

39. (I) Skills and Techniques

Development of fundamental skills and methods of teaching and organizing groups for participation in tennis and minor recreational sports. 60 clock hours. Credit, 1.

67. (I) 68. (II) Skills and Techniques

Development of fundamental skills and methods of teaching and organizing groups for participation in winter sports and the various dance forms including ethnic, social and modern. 60 clock hours. Credit, 1.

RECREATION

Head of Department: Professor William E. Randall. Assistant Professor Harlow; Miss Frank, Mr. Willmann.*

Major Program

The department seeks to prepare men and women for positions involving administrative, supervisory and program leadership responsibilities in municipal recreation agencies, voluntary and youth-serving agencies, hospitals, and industrial and institutional organizations. The program is designed to provide opportunities for a general education,

*On leave of absence.

a knowledge and understanding of people and society, activity skills and resource knowledge, professional competency, and practical experience in various leadership situations.

In addition to completing the curriculum as described below, the student is required to:

1. attend a professional conference approved by the department;
2. participate in programming activities at the Student Union, with a scout troop, or in a similar setting approved by the department;
3. devote one summer (minimum of six weeks) to a recreation position, preferably with pay, in a camp, playground, or similar setting approved by the department.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Statistics 21	3
Bot. 1, Intro. Botany	3	Zool. 1, Intro. Zool.	3
Govt. 25, American Govt.	3	Soc. 25, Intro. to Soc.	3
Humanities Elective	3	M. P. E. 22, First Aid & Safety	3
Rec. 1, Intro. to Rec.	3	Rec. 2, Social Rec.	2
P. Rec. 13, Skills & Tech.	1	P. Rec. 14, Skills & Tech.	1
(Military or Air Science 11 (men)	1)	(Military or Air Science 12 (men)	1)

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25, Humane Letters	3	English 26, Humane Letters	3
Art 14, Intro. to Art or		Zool. 54, Natural History	3
Music 1, Intro. to Music	3	Speech 76, Stage Direction	3
Rec. 25, Group Leadership	3	Soc. 25, Intro. to Soc.	3
H. E. Ed. 63, Art Activity in Rec.	3	Rec. 26, Camp Counseling	3
P. Rec. 39, Skills & Techniques	1	M. P. E. 36, Aquatics or	
(Military or Air Science 25 (men)	1)	W. P. E. 30, Aquatics	2
Elective	3	(Military or Air Science 26 (men)	1)

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
P. Health 61, Gen. & Com.		Rec. 56, Op. of Rec. Facil.	3
Sanit.	3	Psych. 62, Social Psych.	3
Soc. 51, Urban Soc. or		Ed. 66, Audio.visual Aids in Ed.	3
Soc. 52, Rural Soc.	3	English 51, Advanced Expository	
Soc. 75, Social Problems	3	Writing	3
P. Rec. 67, Skills & Techniques	1	P. Rec. 68, Skills & Tech.	1
Electives	6	Electives	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Rec. 85, Practice Lead.	6	Rec. 96, Concepts in Rec.	3
Rec. 77, Comm. Rec.	3	Speech 51, Extempore Speech	3
Rec. 53, Nature rec.	3	Electives	9
Music 3, Elem. Music Theory	3		

1. (1) Introduction to Recreation

Fundamental concepts, current status, and established principles of recreation as a social force. Field trip. 3 class hours. Credit, 3.

2. (II) Social Recreation

Organization, leadership, and activity skills for the planning and conducting of social recreation programs. Field experiences. 1 class hour, 1 2-hour laboratory period. Credit, 2.

25. (I) Group Leadership

Foundations and tools for leadership. Successful leadership techniques for large and small groups such as clubs and committees. Field trips. 2 class hours, 1 2-hour laboratory period. Credit, 3.

26. (II) Camp Counseling

Operating procedures and program of organized camps. Camper guidance, program skills, and practical leadership experience. Two-night camping trip, plus one-day trip. 2 class hours, 1 2-hour laboratory period. Credit, 3.

53. (I) Nature Recreation

Contemporary programs, activity skills, and leadership techniques for recreation programs based upon the natural sciences. Prerequisite, Zoology 54, or consent of instructor. Field trips. 2 class hours, 1 2-hour period. Credit, 3.

56. (II) Operation of Recreation Facilities

Functions and methods for directors of community recreation and park facilities and of organized camps. Field Trip. 3 class hours. Credit, 3.

77. (I) Organization and Administration of Community Recreation

Functions and methods for supervisors and assistant superintendents of various types of park and recreational agencies. Field trip. 3 class hours. Credit, 3.

85. (I) Practice Leadership

Professional field experience with an approved cooperating recreation agency appropriate to the student's career choice. Open only to majors in the concentrated senior block. Credit, 6.

96. (II) Concepts in Recreation

Critical consideration of basic concepts and of current controversies and problems. 2 class hours. Credit, 2.

97. (I) 98. (II) Special Problems

Individual intensive study of an aspect of recreation and the presentation of results in written form. Credit, 2-3.

Department of Athletics

W. P. McGUIRK, *Director*; E. E. LORDEN, *Assistant Director*

The following men coach intercollegiate athletics and intra-murals: R. E. Bergquist, freshman coach of baseball and Stockbridge basketball; R. Bresciani, assistant director sports information; L. E. Briggs, coach of varsity soccer; J. L. Cobb, assistant coach of track and acting director of intramural athletics; J. J. Delaney, assistant coach of football; C. B. Demers, head athletic trainer; J. C. Douglas, coach of wrestling; W. Footrick, coach of track and cross country; V. H. Fusia, coach of football; R. F. Garber, coach of lacrosse; C. S. Gladchcuk, assistant coach of football and coach of golf; F. J. Glatz, assistant coach of football; J. Gundersheim, freshman gymnastic coach; E. Kjeldsen, varsity coach of gymnastics; S. R. Kosakowski, director of Stockbridge athletics and coach of hockey and tennis; J. A. Leaman, Jr., freshman coach of basketball and soccer; E. E. Lorden, coach of baseball; R. W. O'Connell, financial manager of athletics; J. Orr, coach of basketball; R. H. Page, director of sports information; J. R. Rogers, Jr., coach of swimming; T. S. Schmitt, assistant football coach.

DEPARTMENT OF PUBLIC HEALTH

Chairman: Dr. Robert W. Gage. Associate Professor Perriello; Assistant Professor Wisnieski, Miss Reinisch; also Mr. Iantosca and Mr. Snow, Division of Sanitary Engineering, Massachusetts Department of Public Health.

Students majoring in Public Health may select divisional classification in accordance with their special interests. The Department of Public Health offers programs leading to the Bachelor of Science degree in Environmental Health and the Bachelor of Science degree in Medical Technology. The Master of Science degree in Environmental Health is also offered.

PUBLIC HEALTH

The curriculum in public health is designed to prepare a student for a health career. Career opportunities are open in: (1) administration of health services; (2) in basic sciences related to health; (3) in environmental health services; (4) in food and drug protective services; (5) in health education; and (6) in health information and communications. Students electing this major should complete the following courses during their sophomore year: Chemistry 27, Physics 3 and 4, Zoology 35 and Microbiology 1.

During junior and senior years the following courses should be completed: Chemistry 33, Public Health Bacteriology 81 and 90; Public Health 61, 62, 63, 84, and 88. Students planning graduate work in sanitary engineering must take Mathematics 29 and 30 before the end of their junior year. Supporting courses in other departments will be selected with the guidance of an adviser.

FRESHMAN YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 1	2		English 2	2
Speech 3	2	or	Speech 3	2
Mathematics 1 or 2	3		Mathematics 7	3
Chemistry 1	3		Chemistry 2	3
Foreign language	3		Foreign language	3
Botany 1	3		Zoology 1	3
(Military or Air Science 11 (men)	1)		(Military or Air Science 12 (men)	1)
Phys. Ed. 1a, b †	2		Phys. Ed. 2a, b †	2

† Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25	3	English 26	3
Chemistry 27	3	Microbiology 1	3
Physics 3	4	Physics 4	4
Zoology 35	3	Humanities*	3
Social Science*	3	Social Science*	3
(Military or Air Science 25 (men)	1)	(Military or Air Science 26 (men)	1)
Phys. Ed. 31a, b†	2	Phys. Ed. 32a, b†	2

†Not quality point credit.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Public Health 61	3	Public Health 62	3
Chemistry 33	4	Public Health 84	3
3 Electives*	9	Public Health 86	2
		2 Electives*	6

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Public Health 63	3	Public Health 98	3
P. H. Bacteriology 81	3	P. H. Bacteriology 90	3
Public Health 97	3	Public Health 88	3
2 Electives*	6	2 Electives*	6

*Minimum of 9 credits in social sciences and minimum of 6 credits in humanities.

JUNIOR AND SENIOR YEARS

Other Electives

Food Science and Technology
Public Administration
Engineering Drawing
Engineering Geology
Calculus
Animal Hygiene
Elements of Meat Packing
Sanitary Engineering
Dairy Sciences
Planktology
Industrial Mycology
Entomology
Food Analysis
Veterinary Science
Food Processing Engineering
Radio Chemistry

MEDICAL TECHNOLOGY

The curriculum in medical technology is recommended for young men and women who want to prepare for a profession offering a wide opportunity in occupational outlets. Medical technology graduates may be prepared for positions in medical laboratories, in federal, state and local health departments, and in commercial and research laboratories. The following programs are offered:

Option I. This curriculum will consist of a three-year academic program followed by a 12-month internship in an approved School of Medical Technology. After successful completion of the 12-month internship and after satisfying the requirements of the Department of Public Health, a student will receive a Bachelor of Science degree.

FRESHMAN YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 1	2		English 2	2
Speech 3	2	or	Speech 3	2
Mathematics 1	3		Mathematics 2	3
Botany 1	3		Zoology 1	3
Chemistry 1	3		Chemistry 2	3
Foreign Language	3		Foreign Language	3
Phys. Ed. 1a, b†	2		Phys. Ed. 2a, b†	2
			Introduction to Medical Tech.	1

†Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 25	3		English 26	3
Chemistry 27	4		Chemistry 33	4
Art 14, 31, or 33; English 55, 57; Foreign Language Literature; Music 1, 3 or Philosophy 42.	3	or	English 56, 58; Foreign Language Literature or other humanities offered 2nd semester.	3
Psychology 1 or History 5	3		Sociology 25, 26; History 6; Economics 25 or Economics 26	3
Zoology 37	4		Zoology 38	4
Phys. Ed. 31a, b†	2		Phys. Ed. 32a, b†	2

†Not quality point credit.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Chemistry 79	4	Sociology or Economics	3
Microbiology 51	4	Microbiology 54	4
Seminar in Med. Tech.	1	Public Health 88	3
Elective	4	Elective	4
Elective	3		

SENIOR YEAR

During the fourth year students will serve a twelve-month internship in a hospital laboratory approved by the American Society of Clinical Pathologists and one with which the University of Massachusetts has reciprocal affiliation. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for Registry of Medical Technology. The student who begins hospital internship for credit toward a degree must complete the full year of hospital training. The course of training must be consistent at all times with the curriculum formulated by the Board of Schools of Medical Technology as approved by the American Society of Clinical Pathologists, the College of American Pathologists, the American Society of Medical Technologists, and the Council on Medical Education and Hospitals of the American Medical Association.

The curriculum offered by the hospital staff of the approved, affiliated hospital shall have the following schedule:

Subject:	*Weeks*	*Lecture Hours*
Microbiology (Bacteriology, Parasitology, Mycology)	12	24
Chemistry	12	24
Clinical Microscopy (Urine, Spinal Fluid, Feces, etc.)	4	8
Hematology	12	25
Blood Bank & Serology	8	16
Histologic Technique	4	8
	52	105

Offered by University Staff:

Seminar in Medical Technology 1	15	30
Seminar in Medical Technology 2	15	30

Total of Lecture Hours 165, equivalent academic credits 11.
Total of Clinical Hours 1,635, equivalent academic credits 27.

Performance in examinations and final grades will be processed by the University faculty. College credit will be based on the following conversion factors:

(1) The hospital internship consists of 50 weeks at 36 hours per week. An accumulation of 1,800 hours will be realized. (Two weeks of the 52 weeks are allowed for vacation or sick leave.)
(2) Fifteen lecture hours equal one credit.
(3) Sixty clinical hours equal one credit.

165 lecture hours 11 credits
1,635 clinical hours 27 credits

Total Credits Senior Year = 38

OPTION II. This is a four-year academic program leading to a Bachelor of Science Degree. Following graduation the student will be assisted in arranging for a 12-month internship in an approved hospital laboratory school. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology.

FRESHMAN YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 1	2		English 2	2
Speech 3, I or II	2	or	Speech 3, I or II	2
Chemistry 1	3		Chemistry 2	3
Botany 1 or Zoology 1	3	or	Botany 1 or Zoology 1	3
Foreign Language	3	or	Foreign Language	3
Mathematics 1	3		Mathematics 7	3
(Military (men)	1)		(Military (men)	1)
Phys. Ed. 1a, b†	2		Phys. Ed. 2a, b†	2

†Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 25	3	English 26	3
Chemistry 27	4	Zoology 50	3
Physics 3 [1]	4	Physics 4 [1]	4
(Military (men)	1)	(Military (men)	1)
Elective [2]	3	Elective [2]	3
Elective [2]	3	Elective [2]	3
Phys. Ed. 31a, b†	2	Phys. Ed. 32a, b†	2

[1] Strongly recommended.
[2] One semester course in each of two social sciences.
†Not quality point credit.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Microbiology 51	4	Microbiology 54	4
Zoology 37[1]	3	Zoology 38[1]	3
Chemistry 5[2]	4	Chemistry 52[2]	4
Elective*	3	Elective*	3
Elective*	3	Elective*	3

[1] Zoology 35 may be substituted.
[2] Chemistry 33 may be substituted.

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Microbiology 55	4	P. H. Bacteriology 92[1]	3
Zoology 69	3	Public Health 88	3
Chemistry 79	3	P. H. Bacteriology 90	3
Elective[1]	3	Elective[1]	3
Elective*	3	Elective*	3

[1] Microbiology 64 and P. H. Bacteriology 81 recommended as alternate courses.
* During Sophomore-Junior-Senior years — minimum of 9 credits in social sciences and minimum of 6 credits in humanities.

61. (I) 62. (II) Environmental Health

The influence of health measures on community welfare with emphasis on all phases of environmental health. 3 class hours. Credit, 3. Mr. Wisnieski.

63. (I) Industrial Hygiene and Sanitation

The practices and principles of industrial processes involved in industrial health and quality control. 3 class hours. Credit, 3. Mr. Perriello.

64. (II) Microscopy of Water

Microscopic forms of life exclusive of the bacteria. Counting and control of plankton in potable waters. Elements of limnology. Prerequisite, Microbiology 31. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Snow.

81. (I) Applied Public Health Bacteriology

Standard methods used in present day applied bacteriology. Subjects studied include: soils, dairy products, water and shellfish and air analysis. Prerequisite, Microbiology 31, or permission of the instructor. 2 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Perriello.

84. (II) Public Health Administration

The organization, function, and administration of governmental health agencies; including public health laws, regulations, and sanitary codes, their origin and enforcement. 3 class hours. Credit, 3. Mr. Perriello.

86. (II) Public Health Statistics

Evaluation of environmental health practices using graphical summaries and biostatistical methods. Prerequisites, Public Health 61 and 62. 1 class hour, 1 4-hour laboratory period. Credit, 2. Mr. Wisnieski.

88. (I) (II) Epidemiology and Communicable Disease Control

The general principles of the spread of infections, supported through the study of the communicable diseases, grouped according to their modes of transmission. Prerequisite, Microbiology 1, or permission of instructor. 3 class hours. Credit, 3. Mr. Wisnieski.

90. (II) Sanitary Bacteriology

Public Health laboratory procedures including field collection of samples, stream pollution studies, food poisoning and infection, standard methods of food analysis. Prerequisite, Applied Public Health Bacteriology 81, or permission of instructor. 1 4-hour and 1 2-hour laboratory periods. Credit, 3. Mr. Perriello.

92. (Summer) Supervised Field Training

A thirteen-week field training program with an official agency under the supervision of the Staff. This is a prerequisite for professional placement. 13 weeks. Credit, 3-6.

97. (I) 98. (II) Problems

Qualified seniors who have obtained permission from the department may arrange for independent work on special problems in Public Health. Credit, 3. Staff.

DIVISION OF MILITARY AND AIR SCIENCE

The Division of Military and Air Science includes the Department of Military Science and the Department of Air Science. No major is offered in either Department. However, participation in either the Army or Air Force ROTC program for four years will qualify an individual for a Reserve officer's commission. In addition participants who qualify for and desire a military career may be offered a Regular officer's commission in the Army or Air Force depending upon the program he pursues.

Representatives of both services are available on campus during each summer orientation period to answer questions. Freshmen entering an ROTC program do not obligate themselves during the first two years beyond the semester in which they are enrolled. However, credits earned will apply toward graduation. The time to make a decision concerning ROTC is before coming to the summer orientation so registration can be completed.

DEPARTMENT OF MILITARY SCIENCE (GMS)

ALBERT W. AYKROYD, *Colonel, AIS, Head*

Army Military Science courses prepare students for commissioning in the grade of Second Lieutenant in the Regular Army or in the U. S. Army Reserve. The program of general military subjects taught in the University of Massachusetts qualifies graduates for a commission in any of the branches or services of the Army. Thus, regardless of the academic major study program an entering Freshman plans, he will find appropriate leadership opportunities open to him in the modern Army upon his graduation and attainment of a commission. Cadets designated as Distinguished Military Students by reason of their achievement in academic and military studies, may apply for commissions in the Regular Army. Students who intend to continue their education in a graduate field may be deferred, upon application, from active service for periods up to three years after graduation. Army ROTC students are furnished items of uniform and military textbooks without cost.

The first two years of ROTC training are elective, the third and fourth years are both elective and selective in nature. The U. S. Army provides this latter group with a subsistence allowance and additional emoluments that amount to approximately $700.00 All cadets are required to attend a six-weeks summer camp between their junior and senior years. For University of Massachusetts' cadets, this camp is usually held at Fort Devens, Mass.

In addition, qualified students may apply for Army Flight training which can, in turn, qualify them for a private pilot's license. Extra curricular activities encompass Special Forces' training and rifle and pistol marksmanship teams for those interested students.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. S. 11 Fundamentals of Leadership United States and National Security	1	M. S. 12 Fundamentals of Leadership National Defense Organization Familiarization with Military Weapons System	1

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. S. 25 Military History of the U. S. Fundamentals of Leadership	1	M. S. 26 Fundamentals of Land Navigation Introduction to Tactical Concepts Fundamentals of Leadership	1

*JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. S. 51 Principles of Leadership Military Teaching Techniques	2	M. S. 52 Principles of Offensive and Defensive Combat Communications and Control Measures	2

SUMMER SESSION (6 Weeks)

A period of training which permits the practical application of the academic subjects presented at the university. Included also are subjects which are not practical to teach at the institution. Normally cadets from the University of Massachusetts complete this training at Fort Devens, Massachusetts.

*SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. S. 75 Military Law Army Administration	2	M. S. 76 U. S. Role in World Affairs Tactical Concepts	2

*Two academic subjects, selected from the following areas, must be completed by each student, one in his junior and one in his senior year.

a. Effective Communication
b. Science
c. General Psychology
d. Government

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. S. 97 Special Problems	1 or 2	M. S. 98 Special Problems	1 or 2

MILITARY SCIENCE

Head of Department: Professor (Colonel) Albert W. Aykroyd. Assistant Professors (Captain) Fowler, (Captain) McGinnis, (Captain) Nilsson, (Captain) Parker.

11. (I) Introductory Military Science

An introduction to National Defense, organization and officer procurement; a study of the research and development of military weapons and a familiarization of weapons fundamentals; fundamentals of leadership. 2 class hours, 1 laboratory period. Credit, 1.

12. (II) Introductory Military Science

A study of the evolution of U. S. military policy and the part the Army plays in the support of national policies; a continuation of the fundamentals of leadership. 2 class hours, 1 laboratory period. Credit, 1.

25. (I) Basic Military Science

A survey of American military history from the Revolutionary War to the Vietnamese War of 1962-1963, with emphasis on the principles of war, Civil War lessons in mobility, and the effect of guerilla tactics on present day warfare; leadership fundamentals. Prerequisites, Military Science 11 and 12, or equivalent credit as arranged by this department. 3 class hours, 1 laboratory period. Credit, 1

26. (II) Basic Military Science

An introduction to the principles and fundamentals of contemporary military tactical concepts; a study of military land navigation and the application of the aerial photograph. Principles learned are applied in a series of practical exercises and classroom discussions; a continuation of leadership fundamentals. Prerequisite, MS 25. 3 class hours, 1 laboratory period. Credit, 1.

51. (I) Advanced Military Science

A study of the techniques of military instruction and the application of these techniques in classroom discussions and demonstrations; a study of the principles of military leadership and their application in the weekly laboratory period. Prerequisite, MS 26 or equivalent credit for previous military service or training. 3 class hours, 1 laboratory period. Credit, 2.

52. (II) Advanced Military Science

The principles of offensive and defensive combat are studied and an understanding is developed of the application of these to units of the infantry division brigade in a series of map exercises; a portion of this period is devoted to military communications and control measures. Prerequisite, MS 51. 3 class hours, 1 laboratory period. Credit, 2.

75. (I) Advanced Military Science

A continuation of the study of military tactical concepts and its application through classroom discussion and demonstrations. An examination of the U. S. role in world affairs as considered in light of U. S. national power and policies. The geographic-industrial bases of Western Europe, the Far East and the Red Bloc are considered. Prerequisite, MS 52. 3 class hours, 1 laboratory period. Credit, 2.

76. (II) Advanced Military Science

A study of the fundamentals of military law, their application by the unit commander and their relationship to Civil Law; a survey of Army administrative procedures. Prerequisite, MS 75. 3 class hours, 1 laboratory period. Credit, 2.

77. (I or II) Army Flight Training

An aeronautics course offered to eligible senior-year Army ROTC students who elect to serve as pilots in the U. S. Army. Students receive thirty-five hours of classroom instruction in meteorology, navigation, and Civil Air regulations and thirty-six and a half hours of flight instruction under supervision of the Federal Aviation Agency. Upon completion of this course and passing a FAA examination, cadets may receive a private pilot's license. Enrollment by arrangement with the Professor of Military Science. 2 class hours and 2 laboratory periods. Credit, 3.

97. (I) 98. (II) Special Problems

Problems in military science for qualified advanced ROTC students. Independent work on special problems or pertinent intensive studies in military science. Enrollment by arrangement with the Professor of Military Science. Total credit may not exceed 2. Credit, 1 or 2.

DEPARTMENT OF AIR SCIENCE

THOMAS M. CARHART, *Colonel, USAF, Area Commandant*

Head of Department: Professor (Lt. Colonel) Roy D. Simmons, Jr. Assistant Professors (Major) Perry, (Major) Bamber, (Captain) Close, (Captain) Gailey.

The mission of the department program is to develop in selected college students, through a permanent program of instruction, those qualities of leadership and other attributes essential to their progressive advancement to positions of increasing responsibility as commissioned officers in the United States Air Force. It is not expected that all so commissioned will select the U.S.A.F. as a career; nevertheless, the program does offer an excellent means to prepare for such a career.

The first two years of instruction, the basic course, give a foundation for leadership and air and space age citizenship. The program of the last two years, advanced Air Force ROTC and four weeks of summer training at the end of the junior year, is designed primarily to enhance the professional knowledge and leadership capabilities of those qualified and selected for officer training. The following courses, and at least one field trip per year, are required for completion of the Air Force ROTC program:

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Air Science 11, Leadership Laboratory	1	Air Science 12, Foundations of Aerospace Power	1

*And one of the following which may be completed in either semester:

English 1 or 2	2
Speech 3	2
Psychology 1 or 5	3
Chemistry 1 or 3	3-4
Mathematics 1, 2, 4, 5, 6 or 7	3-4

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Air Science 25, Fundamentals of Aerospace Weapons Systems	1	Air Science 26, Leadership Laboratory	1

*And one of the following which may be completed in either semester:

English 25 or 26	3
Economics 25 or 26	3
Sociology 25	3

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Air Science 51, Growth and Development of Aerospace Power I	3	Air Science 52, Growth and Development of Aerospace Power II	3

SUMMER (4 WEEKS)

Summer Training Unit

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Category I-P, I-N Cadets		Air Science 76, The Air Force Officer	1
Air Science 74, Flight Instruction Program — Academic Phase	2	*Geography 81, World Political Geography	3
Category I-P Cadets			
Air Science 75, Flight Instruction Program — Flight Phase	1		
Category II, III, IV Cadets			
Air Science 77, Principles and Problems of Military Leadership	1		
*And either:			
Government 53, International Relations	3		
or			
History 67, Military History of Modern Europe	3		

*Substitutions may be authorized by the Department of Air Science.

DEPARTMENT OF AIR SCIENCE

11. Leadership Laboratory

A formalized phase of leadership training designed to provide experience in the application of leadership principles through group discussion, panels, and other suitable media. Two hours of Leadership Laboratory. Credit, 1.

12. Foundations of Aerospace Power

An introduction to the fundamentals of Air Power, including basic aeronautical science and the organization and operation of the military arm of the Federal Government. 2 class hours and one hour of Leadership Laboratory. Credit, 1.

25. Fundamentals of Aerospace Weapons Systems

A survey of Air Power, weapons and basic concepts governing the employment of air forces, including operations in space. 2 class hours and one hour of Leadership Laboratory. Credit, 1.

26. Leadership Laboratory

A continuation of Air Science 11. Two hours of Leadership Laboratory. Credit, 1.

51. Growth and Development of Aerospace Power I

A course concerning the nature of war; development of airpower in the United States; mission and organization of the Defense Department; Air Force concepts, doctrine, and employment. Two 2-hour class room periods, one hour of which will be supervised research; and one hour of Leadership Laboratory. Credit, 3.

52. Growth and Development of Aerospace Power II

A course concerning astronautics and space operations; and the future development of aerospace power. Includes the United States space programs, vehicles, systems and problems in space exploration. Two 2-hour class room periods, one hour of which will be supervised research; and one hour of Leadership Laboratory. Credit, 3.

Summer Training Unit

An encampment of four weeks' duration designed to increase cadet proficiency in essential areas of junior officer training. Two encampments per summer are scheduled at a United States Air Force Base. Either the first or second encampment may be designated.

74. Flight Instruction Program — Academic Phase

An academic course in aeronautics offered those cadets eligible for and electing to serve as pilots or navigators in the United States Air Force. This course of instruction entails 30 hours of classroom instruction. Completion of this course is adequate preparation for the Federal Aviation Agency written examination. 2 class hours and one hour of Leadership Laboratory. Credit, 2.

75. Flight Instruction Program — Flight Phase

An aeronautics course offered those cadets eligible for and electing to serve as pilots in the United States Air Force. This course of instruction provides a total of 36½ hours of flight instruction. Cadets completing this course can apply for a private pilot's license. Prerequisite: Air Science 74 or simultaneous enrollment. 3 laboratory periods and one hour of Leadership Laboratory. Credit, 1.

76. The Air Force Officer

A study of Air Force administrative procedures; the responsibilities and obligations of the Air Force Officer; and rules of conduct of the armed services. 1 class hour and one hour of Leadership Laboratory. Credit, 1.

77. Principles and Problems of Military Leadership

Principles and techniques of leadership and management in the armed forces, with emphasis on the USAF. 1 class hour and one hour of Leadership Laboratory. Credit, 1.

RELIGION

CHAPLAINS POWER, RUCHAMES, and BERGER, *Advisers*

Although there is no department of religion at the University of Massachusetts, students interested in pursuing religion as an academic discipline have certain opportunities, both in curricular and co-curricular ways.

In the formal curriculum, courses are offered by several departments in the College of Arts and Sciences. Credit courses in history, such as those covering the ages of medieval civilization and of the Reformation, for example, afford systematic study into the religious institutions and movements of those periods. Similarly, those offered by the philosophy department in the Philosophy of Religion and in Oriental Philosophies provide a critical and constructive study of basic issues, in both the contemporary western world and Asia. Also, certain courses in other departments deal with matters of religion.

In addition to curricular work, students may learn from co-curricular programs of an academic nature offered by the Chaplains and the campus religious organizations. Each year classes (non-credit) are taught by the Chaplains and invited lecturers on topics such as Basic Beliefs and Practices of Judaism, Catholic Faith and Practices, Essentials of Protestant Christianity. Classes in Hebrew and Yiddish, study groups on various problems in campus living, and workshops on personal relations are also open to students.

The B'nai B'rith Hillel Foundation, the Christian Association, and the Newman Club frequently bring to the campus lecturers and scholars of national and international repute to speak at open meetings. Distinguished scientists, journalists, and government officials, as well as theologians and religious leaders, have come as guests of the religious organizations, and some provide leadership for large-scale events such as retreats, the Religious Embassy, and holy day observances. Lectures on religion are occasionally offered in a series of three or more under the leadership of well-known scholars and teachers. The educational and cultural programs of the campus religious organizations are open to all who are interested.

Scholarships

GENERAL SCHOLARSHIPS

Applicants for scholarships may be awarded University scholarships, undergraduate assistantships, or specific scholarships as follows:

University Scholarships. The Commonwealth of Massachusetts annually provides scholarships in varying amounts for members of each of the four undergraduate classes of the University. Upperclass students may obtain application forms from the Office of Placement and Financial Aid Services. Entering freshmen may obtain application forms from this office or from the Office of Admissions and Records.

Undergraduate Assistantships. The Commonwealth of Massachusetts provides money to be awarded to members of the sophomore, junior and senior classes of the University for a combination work-scholarship program. Students receiving such awards are required to work a minimum number of hours per week under faculty and staff members in research, statistics and other areas of academic professional activities.

Albert Pierpont Madeira Scholarship Fund. Established in 1964 to honor the memory of Albert Pierpont Madeira (1911-1964), Assistant Professor of English, a distinguished teacher and devoted friend of generations of students. The fund was established from an initial grant by the General Electric Company in the amount of $9,000, the sum won by a team of University scholars who successfully competed in the General Electric College Bowl over national television. Retiring as undefeated national champions, one of only 13 collegiate teams to do so out of more than 200 competing to that date, the four scholars — Susan Tracy '65, Michael Berrini '65, William Landis '65, and David Mathieson '64 — were coached for many months by Professor Madeira. Because Professor Madeira had expressed great faith in the team's ability to compete with opponents from institutions throughout the country, the team decided to appear on the program despite Professor Madeira's sudden death shortly before the date set for the first contest. After five successful appearances, the team was presented with the General Electric scholarship grant and an additional $1,500 from Gimbel's Department Store, New York. The total grant of $10,500, plus any other funds to be added thereto, is held as an endowed fund, the annual interest therefrom to be awarded in the form of scholarships to sophomores, juniors and seniors at the University who have been recommended by the Faculty on the basis of good scholastic performance and demonstrated services to the University and to their fellow students. Final selection of individual recipients is made by the Upperclass Sub-Committee of the University Committee on Financial Aid and Scholarships.

Alpha Sigma Phi Scholarship for needy students.

Danforth Keyes Bangs Scholarship for the aid of industrious and deserving students.

Lucius Clapp Fund to provide scholarships and loans to deserving students.

Foreign Student Scholarships. A limited number of scholarships, involving waiver of tuition fees only, awarded on basis of merit and need. Applications should be addressed to the Adviser to Foreign Students.

Henry Gassett Scholarship for a worthy undergraduate student.

Charles A. Gleason Scholarships. General Scholarship for worthy students.

Whiting Street Scholarship. Scholarships of $50 each for deserving students.

University Associate Alumni Scholarships. A limited number of scholarships awarded on the basis of leadership, need, scholarship and participation in extracurricular activities.

University Foundation Scholarships. A limited number awarded to needy scholars.

RESTRICTED SCHOLARSHIPS

George H. Barber Scholarship and Grant-in-Aid Awards. A limited number of scholarships or grants-in-aid based on evidence of outstanding athletic performance and good citizenship, need or high scholarship.

Class of 1882 Scholarship for the aid of a worthy student of the junior or senior class.

Frederick G. Crane Scholarships for the aid of worthy undergraduate students, preference given to residents of Berkshire County.

Stephen Davis Scholarship. Established by gift of Mr. and Mrs. Benjamin Davis of New York City in memory of their son, Stephen Davis, class of 1954, who lost his life while serving as an officer with the United States Air Force. For a male undergraduate majoring in Liberal Arts or Social Sciences who has participated in the athletic program. The selection of the recipient is made jointly by the Dean of the College of Arts and Sciences and by the Dean of the School of Physical Education. The student selected receives each year, not to exceed four years, the full income from the fund so long as he remains in good standing in the University and continues to major in Liberal Arts or the Social Sciences. Annual income is approximately $800.

Philip B. Hasbrouck Scholarship Fund. Established as an endowment fund through the generosity of the Class of 1910. Income from the fund is used for scholarships for certain deserving juniors and seniors studying a science essential to the national welfare, particularly physics. Students may obtain further information about the scholarship by inquiring at the Office of Placement and Financial Aid Services.

Interfraternity Council Scholarship. A $100 scholarship awarded annually to a member of one of the social fraternities. The recipient must show evidence of need. In addition, he must have a record of participation in extracurricular activities and have at least a 2.5 quality point average.

Betsey C. Pinkerton Scholarships. Two general scholarships for graduates of the schools in the city of Worcester.

Sigma Xi Scholarship Award. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of $100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

Wilbur H. H. Ward Scholarships. Twenty-five scholarships of approximately $100, known as the Wilbur H. H. Ward Scholarships. The Ward Fund is administered by a Board of Trustees independent of the University. Applicants for these scholarships write to Mrs. Marian R. Erush, Stockbridge Hall, University of Massachusetts, Amherst. They are available to Hampshire County men.

College of Agriculture

Alvord. For students specializing in the study of Dairy Husbandry or Dairy Manufacturing with the intention of becoming an investigator, teacher, or special practitioner in the dairy industry. Restricted to students who do not use tobacco or fermented beverages.

O. G. Anderson Memorial Fund. For needy and worthy students majoring in pomology. To be used for the purchase of books and supplies. Granted only on the recommendation of the Department of Pomology.

Ascension Farm. For men students in the College of Agriculture. Residents of Berkshire County have preference, but awards may be made to students from Hampshire, Hampden, and Franklin Counties.

Berkshire County Farm Bureau Scholarship. The Berkshire County Farm Bureau is sponsor of a scholarship awarded yearly to a Berkshire County boy or girl as a means of assisting him or her to obtain a college education.

Boston Market Gardeners' Association. A $100 scholarship for a Sophomore in agriculture. Applications should be made to the Secretary of the Boston Market Gardeners' Association, 240 Beaver Street, Waltham 54, Massachusetts.

Boston Stewards Club. Scholarships to students majoring in Food Management. Awards are made on basis of both financial need and scholastic attainment.

Buttrick. For junior, senior, or graduate students majoring in Dairy Industry or Food Science and Technology. Scholarships will range from $100 to $500 per year depending upon scholarship achievement and need.

H. B. Cantor Foundation Scholarship. A $500 scholarship for students majoring in hotel and food management. Students must be recommended by the University Scholarship Committee. This scholarship may be awarded to either a four-year or a Stockbridge School of Agriculture student.

Charles M. Cox Trust Fund Scholarship of $300 is awarded to a student or students in the College of Agriculture on the basis of need, character and scholarship ability. Preferably the scholarships will be awarded to undergraduate majors in dairy husbandry or poultry husbandry.

Lotta M. Crabtree. For students in the College of Agriculture. Based on scholarship and need.

J. W. D. French Fund. For students in dairy and forestry, and allied subjects.

Hampshire County Farm Bureau Scholarship. The Hampshire County Farm Bureau is sponsor of a scholarship awarded yearly to a Hampshire County boy or girl as a means of assisting him or her to obtain a college education.

Charles H. Hood Foundation. Awarded to two students in the College of Agriculture, with preference given to those studying the production of milk. Based on scholastic standing, character, industry, and personality.

Howard Johnson. A $500 scholarship for a student majoring in Food Management. This scholarship is awarded in recognition of high academic performance and character.

Massachusetts Flower Growers' Association Scholarships. Two $200 scholarships awarded to qualified juniors or seniors majoring in Floriculture.

Margaret Motley. For a woman student majoring in Floriculture or Landscape Gardening. Need, scholarship, and promise of success form the basis of the award which is provided by the Garden Club Federation of Massachusetts, Inc.

New England Wholesale Food Distributors' Association. A $500 annual scholarship for agricultural students preparing for a career in the food distribution industry with preference given to students majoring in Agricultural and Food Economics, Award based on scholastic achievement, character and personality.

Porter L. Newton. For students majoring in Agriculture who are residents of Middlesex County.

Frank H. Plumb. For students majoring in the College of Agriculture.

Ralston Purina. A $500 Scholarship for a student majoring in Animal Science or Poultry Science.

V. A. Rice Scholarship Fund. A $100 scholarship for a worthy student majoring in Animal Husbandry.

Sears, Roebuck Foundation. Four scholarships for outstanding freshmen in the College of Agriculture, based on scholarship, leadership, personality, business ability, or special achievement. The outstanding freshman recipient is eligible for a special sophomore scholarship.

Springfield Garden Club. For students living in the vicinity of Springfield, Mass., and majoring in some phase of Horticulture.

Ellsworth Milton Statler Foundation Scholarships. Two $500 scholarships for students majoring in Hotel and Food Management. Students must be recommended by the University Scholarship Committee and approved by a Committee of the Statler Foundation. These scholarships may be awarded to either four-year or Stockbridge students.

George Treadwell. A $100 scholarship given by Worcester County Poultry Association to a needy and worthy student from Massachusetts who is majoring in Poultry Husbandry at the Stockbridge School of Agriculture.

School of Business Administration

National Food Brokers Association Scholarship. Four hundred dollars to be awarded to either an undergraduate or graduate student in the Department of Marketing who is interested in making a career in the food industry.

School of Engineering Scholarships

Alumni Scholarships. Provided by annual contributions from graduates and friends of the School of Engineering to provide scholarships to deserving and well qualified students pursuing work in a major field of engineering. They are available to freshmen and upperclassmen.

Kollmorgen Optical Corporation Tuition Scholarship. Awarded annually to a junior or senior student majoring in mechanical engineering. Awarded on the basis of need and superior scholastic attainment.

Western Massachusetts Section, American Society of Mechanical Engineers. Awarded annually to a junior or senior mechanical engineering student who is a legal resident of the area represented by the section. Awarded on the basis of need and scholastic attainment.

Military Scholarships

United States Army ROTC Scholarship. The U. S. Army Reserve Officers Training Corps offers one or more scholarships to selected members of ROTC.

United States Air Force ROTC Scholarship. The U. S. Air Force Reserve Officers Training Corps offers one or more scholarships to selected members of AFROTC.

College of Arts and Sciences

Richard W. Fessenden Memorial Scholarship. An award made to undergraduate students majoring in chemistry upon the recommendation of the department of chemistry. This award is made possible by donations from friends and former students of Dr. Fessenden, former professor of chemistry at the University.

Massachusetts City Managers' Association Scholarship. Tuition scholarship awarded by committee composed of the President of the City Managers' Association, the head of the department of government and the Director of the Bureau of Government Research, to an undergraduate or graduate student majoring in government.

Public Health Scholarships

Massachusetts Department of Public Health Scholarship. A scholarship in the amount of $300 made to an outstanding student in the field of bacteriology and public health.

Massachusetts Association of Sanitarians Scholarship. A scholarship in the amount of $100 made to an outstanding student interested in the general field of public health.

Massachusetts Milk Inspectors' Association. One or more scholarships, each in the amount of $100, made to outstanding students interested in the field of sanitation or milk sanitation.

Public Health Service Traineeship for graduates and undergraduates, one or more annually, complete expenses paid as a stipend.

William B. Palmer Scholarship for juniors and seniors majoring in Sanitary Science or Public Health, $300 annually (The International Association of Milk and Food Sanitarians).

School of Home Economics

Berkshire County Women's Advisory Council Scholarship. For a student majoring in Home Economics who is a resident of Berkshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Minnie R. Dwight Scholarship. For a student majoring in Home Economics who is a resident of Hampden County. This scholarship is awarded for four years if scholarship is maintained.

Mrs. Clifton Johnson Scholarship. For one or more Home Economics students who are residents of Hampshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Helen Knowlton Award and Scholarships. The award is for the highest ranking senior Home Economics student. Scholarships are for other deserving Home Economics students.

Massachusetts Home Demonstration Council Scholarship. For a Home Economics student at Framingham State Teachers College or the University of Massachusetts.

Sears, Roebuck Foundation Scholarships. For two incoming freshmen. Recipients are selected by the School of Home Economics from applications filed with the University Committee on Financial Aid and Scholarship. The basis for this award is high scholastic record, qualities of leadership and interest in Home Economics as a career.

Mildred Thomas Scholarship. For a student majoring in Home Economics at Regis, Simmons, State College in Framingham, or the University of Massachusetts. The applicant must be a resident of Worcester County and have completed the Freshman year.

Helen A. Whittier Award. For a senior Home Economics student selected on basis of scholarship, need, and character.

4-H Scholarships

Cotting Memorial Scholarship. All college expenses of freshman year — for a woman student. Recipient of this scholarship is selected by a committee of the New England Branch of the Farm and Garden Association from among candidates proposed by State Leaders of 4-H Club work in the New England states.

Esso Scholarship. This scholarship of $800 is awarded to a freshman enrolled in the College of Agriculture. The recipient receives $200 during each of the four years he is enrolled. Applications for this scholarship must be submitted to the State 4-H Club Leader.

George L. Farley Scholarships. The Massachusetts Society for Promoting Agriculture has established a scholarship in memory of George L. Farley. The income of approximately $60 per semester is awarded to deserving 4-H Club members, men or women, recommended by the State Leader of 4-H Clubs from applications submitted by County 4-H Club Agents.

Scholarships for Women Students Only

Chi Omega Award. The local chapter of the Chi Omega Sorority offers an annual scholarship of $25 to a woman student majoring in the department of economics or psychology who has the highest scholastic average at the end of the first semester of the senior year.

Greater Springfield Panhellenic Association Award. This award is given each spring for use in the sophomore, junior, or senior year to a woman student from Western Massachusetts. The award is based on scholarship and need, character and evidence of leadership in campus activities.

Polish Junior League Scholarship. An award by the Polish Junior League to a woman student of Polish descent, at the end of her junior year, paying full tuition for the senior year. The basis of this award is character and scholastic achievement.

Scholarships Abroad

Many U. S. Government, private foundation, and foreign government scholarships are available to qualified seniors for graduate studies abroad. Interested students should get an early start in language competence and in maintaining academic excellence. Several campus committees screen students for Fulbright Scholarships, Danforth Fellowships, Woodrow Wilson Fellowships, etc.

Applicants are usually considered in October of the senior year. Specific deadlines are posted on campus bulletin boards. The Office of Placement and Financial Aid Services maintains a library of up-to-date information about such scholarships.

Honors, Prizes and Awards

Scholastic Prizes

PHI KAPPA PHI AWARDS FOR SCHOLARSHIP. The University of Massachusetts chapter of Phi Kappa Phi, national all-university scholastic honor society, annually presents substantial monetary awards to the outstanding scholar or scholars of each of the three upper classes. These awards, based upon cumulative scholastic averages and character, are presented at the Honors Banquet in the spring.

THE BURNHAM PRIZES. These were made possible through the generosity of Mr. T. O. H. P. Burnham of Boston. Prizes of $25 and $15 are awarded through the Department of Speech to those students delivering the best and second best oral interpretation of literature in the Burnham Contest. Preliminary contests are open under certain conditions to freshmen and sophomores.

THE FLINT PRIZES. The Flint Speaking Contest was established in 1881 by a gift of the late Charles L. Flint, a former president of the College. After his death the prizes were continued by college appropriation. Awards of $25 and $15 are presented through the Department of Speech as first and second prizes respectively to those two upperclassmen delivering the best extemporaneous speeches in the contest.

HILLS BOTANICAL PRIZE. This is given through the generosity of Henry F. and Leonard M. Hills of Amherst for the first and second best herbaria. Competition is open to members of the senior, junior and sophomore classes. First prize is $20, second prize $15.

MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE PRIZES. Three prizes of $25, $15, and $10 are awarded to those senior students who are judged to have made the best record in a speaking contest held early in March.

SIGMA Xi SCHOLARSHIP AWARD. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of $100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

BETTY STEINBUGLER PRIZE IN ENGLISH. This prize was endowed by John L. Steinbugler, New York City, in honor of his daughter, Elizabeth Steinbugler Robertson, a graduate of this University in 1929. It is awarded to a woman in the junior or senior class who has written the best long paper on a subject of literary investigation in a course in English during the year.

L. R. WILSON AWARD IN GEOLOGY. This award, named in honor of the former head of the Geology Department, is conferred on the graduating senior with an outstanding academic record as a major in geology.

Athletic Awards

CHESTER F. BOWEN JR. MEMORIAL AWARD. The class of 1949 presented the Chester F. Bowen Jr. Memorial Award in track and cross-country to the University as its class gift. Members of the class felt that this gift would be the most appropriate which they could give the University, since it would be a fitting memorial to a former classmate and a worthy award for the outstanding athlete in varsity track and cross-country.

SAMUEL S. CROSSMAN MEMORIAL TROPHY. This award is made to the member of the senior class who must have received two varsity awards, had an above average academic record, and possessed qualities of enthusiasm, cooperation, leadership, and be recognized as the outstanding student-athlete on the campus. The trophy was established by the University Athletic Council. The award is dedicated to the memory of Samuel S. Crossman and consists of a trophy upon which the name of the student chosen is to be inscribed. A small replica will be presented for his permanent possession.

L. L. DERBY AWARD. This plaque is presented by the Alumni Varsity M Club each year at its Commencement meeting to that member of the track team who is considered to have been the most valuable member of the team during the past season.

EASTERN COLLEGE ATHLETIC CONFERENCE AWARD. This award is designed to signalize and honor the student whose combined record of academic and athletic activity at each Conference member college. The E.C.A.C. is composed of 114 colleges and universities located in the eastern section of the United States.

THE WILLIAM T. EVANS MEMORIAL TROPHY. This trophy is given each year to that member of the varsity football team who through his sportsmanship, football ability, character and personality, has exemplified the character and spirit of the person in whose memory this memorial trophy is dedicated. The trophy is dedicated to the memory of William T. Evans, a former member of the class of 1942, who died December 9, 1941. This trophy is presented annually by the class of 1942.

GOLF AWARD. Presented to the most valuable member of the Golf Team as chosen by the letter men of the squad.

GYMNASTICS CUP. Awarded to the most valuable member of the Gymnastics Team.

HOCKEY AWARD. This plaque shall be awarded annually at the Commencement meeting of the Varsity Club, to that member of the hockey team who is considered to have been the most valuable player to the team.

THE JOSEPH LOJKO MEMORIAL PLAQUE. This plaque is presented to a senior three sport letter man, having a satisfactory scholastic record and showing those qualities of enthusiasm and cooperation which make for leadership. It is awarded in honor of Joseph Lojko of the Class of 1934, outstanding athlete who died while a senior in the College.

MANAGER OF THE YEAR AWARD. The Athletic Association awards a gold plaque to that varsity sports manager who has demonstrated initiative and proficiency in managerial duties.

PISTOL MEDAL. Award on a point basis to a member of the varsity team.

THE ALLAN LEON POND MEMORIAL MEDAL. This medal is awarded for general excellence in football in memory of Allan Leon Pond of the class of 1920, who died February 26, 1920. He is described as "A congenial companion, a devoted lover of Alma Mater, a veteran of World War I, a fine all-around athlete and a true amateur. He would rather win than lose, but he would rather play fair than win." He has been characterized as a typical student of the University.

RIFLE AWARD. Awarded on a point basis to the outstanding member of the varsity rifle team.

PAUL SEARS PUTNAM MEMORIAL TENNIS TROPHY. This trophy is awarded to that member of the varsity tennis team who has displayed by his conscientious endeavor, clean play, good sportsmanship and all-around ability as an athlete and scholar, that he is a credit to his team and University, and shall have his name inscribed on the trophy. He shall also be presented with a suitable medal or watch charm. The trophy is established in memory of Paul Sears Putnam, '38, by the members of his family, in the hope that it will stimulate and encourage students to emulate his characteristics of wholehearted enthusiasm and good sportsmanship, true cooperation and the constant endeavor to always give to the best of their ability in any project they may undertake.

GEORGE HENRY RICHARDS MEMORIAL CUP. This cup is awarded annually to the member of the basketball team who shows the greatest improvement in leadership, sportsmanship, and individual and team play during the year. It is in memory of George Henry Richards of the Class of 1921 who died suddenly while a student at the College.

SAMUEL B. SAMUELS BASKETBALL CUP. This cup is presented annually in the name of Samuel B. Samuels of the Class of 1925 who was an outstanding basketball player during the early years of basketball as a varsity sport at the University. The trophy is awarded to that letter man who is a regular member of the varsity team and who has performed with excellence during scheduled varsity games.

MAURICE SUHER SOCCER PLAQUE. This trophy is to be awarded annually to that letter man of the varsity team who is deemed to have been the most valuable member of the team. It is presented to the University by Maurice Suher of the class of 1930, who was one of the two students largely instrumental in having soccer recognized as a varsity sport at the University. He played on the first varsity soccer team at the University of Massachusetts, in the fall of 1929.

SPORTS DAD AWARD. The Sports Dad Association was formed in 1958 and consists of fathers of all varsity athletes. This association awards three trophies to outstanding athletes for scholastic achievement and athletic excellence.

SWIMMING TROPHY. Awarded to the most valuable member of the varsity swimming team.

E. JOSEPH THOMPSON MEMORIAL TROPHY. This baseball trophy is given by Thomas Thompson in memory of his brother, E. Joseph Thompson who graduated from Massachusetts State College in 1932. He was president of the Student Senate, a varsity letter man in football and baseball, and an outstanding campus citizen. The award goes to that member of the varsity baseball team who best exemplifies the most admirable characteristics of the sport each year.

WRESTLING TROPHY. Awarded to the most valuable member of the varsity wrestling team.

MILITARY AND AIR SCIENCE HONORS AND AWARDS

Leadership, scholarship, and proficiency in the work of the Military and Air Science departments are recognized by honors and awards announced at the Annual Spring Review in May.

Department of Military Science

DISTINGUISHED MILITARY STUDENTS. Each year the Professor of Military Science designates as distinguished military students those members of the first year advanced course who possess outstanding qualities of leadership, high moral character, and a definite aptitude for the military service. Students who are so designated must possess an academic standing in the upper half of their class or in the upper ten per cent of their class in military subjects. All distinguished military students are authorized to wear the distinguished military student badge.

DISTINGUISHED MILITARY GRADUATES. Each year the Professor of Military Science designates as distinguished military graduates those members of the graduating class who were previously designated as distinguished military students and have maintained the same high standards required for such designation and have successfully completed training at the Reserve Officers' Training Camp.

ARMED FORCES COMMUNICATIONS ASSOCIATION HONOR AWARD. Awarded by the Armed Forces Communications Association to the outstanding senior ROTC cadet majoring in electrical engineering. The winner is presented with an appropriately engraved gold medal and scroll.

MILITARY SCIENCE FACULTY AWARD. Awarded by the Military Science faculty to the Cadet Colonel of the Cadet Brigade for outstanding leadership. The winner is presented a complete set of officers' insignia.

RESERVE OFFICERS ASSOCIATION AWARD. Awarded by the Reserve Officers Association of the United States, Massachusetts Department, to the Senior Army ROTC cadet who is outstanding in military proficiency. The winner's name is engraved on a plaque and a medal, appropriately engraved, is given by the Massachusetts Department. A complete set of officers' insignia is given to the individual by the Amherst Chapter.

ELIZABETH L. McNAMARA TROPHY. Awarded by Mrs. Elizabeth L. McNamara, a former trustee of the University of Massachusetts for many years, to the Army ROTC cadet ranking first in scholarship in the second year basic course. The winner's name is engraved on a plaque and a sterling silver goblet, appropriately engraved, is given to the individual.

AMHERST LIONS CLUB AWARD. Awarded by the Amherst Lions Club to the Senior Army cadet who has been most outstanding at the ROTC Summer Training Camp.

DEPARTMENT OF THE ARMY AWARDS. The Department of the Army awards annually the Superior Cadet Ribbon with certificate and lapel device, to one outstanding student in each academic class. The winner of the award must be in the upper one fourth of his academic class and be selected by the PMS and Dean of Men.

THE JOHN C. HALL TROPHY. Awarded annually to the second year basic course student who ranks number one in military proficiency. The winner's name is engraved on a loving cup which is of permanent nature and maintained in the military offices. A cordial type sterling silver goblet appropriately engraved is presented to the winner.

ASSOCIATION OF THE UNITED STATES ARMY MEDAL AND CERTIFICATE. Awarded annually by the publishers of Army magazine to the Junior Cadet who has demonstrated outstanding qualities of leadership and efficiency.

CHICAGO TRIBUNE AWARDS. Awarded annually to two Military Science I and Military Science II Cadets. The recipients must be members of the Bay State Special Forces, who have demonstrated outstanding qualities of leadership and military proficiency.

SOCIETY OF AMERICAN MILITARY ENGINEERS AWARD. A gold medal is presented annually by the Society of American Military Engineers to the outstanding engineering student enrolled in advanced Military Science.

DISTINGUISHED AFROTC CADET BADGE. Each year the Professor of Air Science will select from the students who are completing the second year advanced course, AFROTC, those who possess outstanding qualities of character, leadership, and a definite aptitude for the military service for designation as Distinguished AFROTC Cadets.

DISTINGUISHED AFROTC GRADUATE. Each year the Professor of Air Science will designate the Distinguished AFROTC Graduates from those Distinguished AFROTC Cadets who have completed the advanced course, AFROTC, and who will receive their baccalaureate degree. The Distinguished AFROTC Graduates are eligible for a regular Air Force Commission.

CHICAGO TRIBUNE AWARDS. Awarded to two Air Science freshmen and sophomore cadets who have maintained the highest AFROTC grades and general academic excellence. The awards are engraved medals.

GENERAL DYNAMICS AWARD. Awarded to the most outstanding Air Science sophomore cadet who has applied for the Advanced Course, is interested in and qualified for Flight Training. The award is an aircraft model.

AMHERST POST AMERICAN LEGION TROPHY. Awarded by the Amherst Post American Legion to the Air Science sophomore cadet who has demonstrated the most outstanding abilities in Military Drill and Scholarship. The trophy is an engraved silver cup.

THE SOCIETY OF AMERICAN MILITARY ENGINEERS ROTC AWARD. Awarded by the Society of American Military Engineers to the Air Science cadet who is the outstanding engineering student of the year in his group in the AFROTC unit, as recommended by the Dean of the School of Engineering and the Professor of Air Science.

NATIONAL DEFENSE TRANSPORTATION ASSOCIATION AWARD. Awarded to the cadet who has demonstrated outstanding leadership qualities, academic achievement, aptitude for military service, and meritorious achievement and noteworthy service in the promotion of preparedness for national defense of the United States.

AMHERST LIONS CLUB AWARD. Awarded to the outstanding AFROTC cadet for his activities at a Summer Training Unit.

AIR FORCE ASSOCIATION MEDAL. Awarded by the Air Force Association to the most outstanding Air Science cadet who has completed Summer Training Unit. The award is an engraved medal.

RESERVE OFFICERS ASSOCIATION MEDALS. Awarded by the Massachusetts Reserve Officers Association to the Air Science 1, 2, and 3 cadets who have been outstanding in scholarship and military proficiency.

AIR SCIENCE TROPHY. Awarded by the Department of Air Science to the graduating Air Science senior cadet who has demonstrated superior qualities of leadership, military bearing and scholarship. The trophy is an engraved silver cup.

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION MEDAL. Awarded by the Armed Forces Communications and Electronics Association to the graduating Air Science senior cadet majoring in electrical engineering, who has demonstrated outstanding qualities of military leadership, high moral character and a definite aptitude for military service. The award is an engraved medal.

SONS OF THE AMERICAN REVOLUTION MEDAL. Awarded by the Sons of the American Revolution to an Air Science freshman cadet who has shown firm belief in, knowledge of, and a positive attitude toward the Constitution of the United States of America; has maintained a grade average of A in AFROTC subjects; and has expressed and demonstrated an interest in both the Advanced Course and in duty as an Air Force officer. The award consists of a bronze medal with a ribbon service bar.

CONVAIR AFROTC AWARD. Awarded to the Air Science 2 cadet who had demonstrated an outstanding potential for high productivity, adaptability to change, aptness, maintenance of the highest personal and ethical standards.

AIR FORCE TIMES AWARD. The award may be presented annually to the graduating cadet at each detachment who has distinguished himself by contributing materially to constructive public attention for his Cadet Corps.

Honor Societies

Academic Honor Societies

Phi Kappa Phi. The Honor Society of Phi Kappa Phi is a national organization, and has been represented on this campus since 1904. Its primary objective is the recognition and encouragement of superior scholarship in all fields of study. Good character is an essential supporting attribute. The Massachusetts chapter elects undergraduates in either their junior or senior years. Members of the Faculty and graduate students are also eligible for election.

Sigma Xi. The Society of the Sigma Xi is the national honor society whose objective is the encouragement of original investigation in science, pure and applied. Since 1938, a chapter of the Society has been active on the campus of the University. The Chapter may elect to associate membership undergraduate students who have shown marked excellence in the study of recognized fields of the sciences and engineering. Election to full membership is accorded those who have clearly demonstrated ability to pursue independent scientific research. The Chapter sponsors a program of public lectures and a number of awards designed to foster the objectives of the Society.

Sigma Gamma Epsilon. The Beta Theta chapter of the Sigma Gamma Epsilon Fraternity was installed at the University of Massachusetts in 1951. The purpose of the fraternity is to stimulate scholastic, scientific, and social advancement of students of the earth sciences in universities and scientific schools with recognized standings in the United States and Canada. Membership is open to men majoring in geology, mining, metallurgy, ceramics, petroleum engineering, or other branches of earth sciences, who meet the requirements of the fraternity.

Omicron Nu. The Alpha Pi chapter of the Society of Omicron Nu was installed on the campus in 1952. The purpose of the Society is to recognize superior scholarship and to promote leadership and research in home economics. Membership is open to juniors and seniors majoring in home economics who meet the requirements of the society.

Phi Tau Sigma. Phi Tau Sigma Honorary Society is the international honor society for food science. It was founded at the University of Massachusetts in 1953, and its executive headquarters are permanently located here. Its purpose is to encourage and recognize achievement in food science. Senior students from all departments related to food science are eligible for election to membership if they meet scholastic and character requirements of the University Chapter.

Tau Beta Pi. The Massachusetts Zeta Chapter of Tau Beta Pi was installed on campus in the fall of 1955. The society exists for the purpose of honoring engineering students of high scholarship, character, and interest in campus activities. Senior and junior students in the School of Engineering are eligible for election to membership if they meet the requirements.

Beta Gamma Sigma. The Gamma Chapter of the University of Massachusetts was installed in 1959. The purposes of the Society are to encourage and reward scholarship and accomplishment among students in commerce and business administration; to promote the advancement of education in the art and science of business; and to foster integrity in the conduct of business operations.

Alpha Lambda Delta. The Scholastic Honor Society for Freshman Women was installed at the University of Massachusetts as a chapter of Alpha Lambda Delta, national honor society, in 1960. The purpose is to promote intelligent living and to encourage superior scholastic attainment among freshman women. Members are students who achieve averages of 3.5 or above in the first semester or in cumulative average at the end of the first year of college.

Phi Eta Sigma. The Society of Phi Eta Sigma was installed on the campus in 1955. The purpose of the Society is to recognize outstanding scholastic achievement by freshmen men and to encourage a higher standard of learning among all freshmen. Honorary membership is granted those faculty members who are most effective in encouraging students in the attainment of these goals.

Eta Kappa Nu. Delta Eta Chapter of the Eta Kappa Nu Association was installed on this campus in 1960. The purpose of the association is to recognize outstanding scholarship and leadership in the field of Electrical Engineering. Superior junior and senior students are selected for membership in the fall and spring of each year.

Alpha Zeta is an honorary fraternity with membership limited to men majoring in the College of Agriculture. Election to membership is based upon academic excellence and qualities of leadership.

Xi Sigma Pi. The Psi Chapter of Xi Sigma Pi, national forestry honor fraternity, was inaugurated at the University in 1962. The purpose of the fraternity is to secure and maintain a high standard of scholarship in forestry education. Membership is open to juniors and seniors majoring in forest management, wood utilization, and wildlife management who demonstrate leadership ability and who meet other requirements of the fraternity.

UNIVERSITY OF MASSACHUSETTS · AMHERST · 1863 ·

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Raymond Wyman, *University Representative, WFCR* (University of Massachusetts).

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*On leave 1964–65

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Luther Banta, b.s. (Cornell University), *Assistant Professor of Poultry Husbandry*, Emeritus.

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Lyle Lincoln Blundell, b.s. (Iowa State College), *Professor of Landscape Architecture*, Emeritus.

Fayette Hinds Branch, b.s. (Cornell University), *Extension Professor of Agricultural Economics and Farm Management*, Emeritus.

Mildred Briggs, a.b. (DePauw University), m.s. (Iowa State College), *Associate Professor of Home Economics*, Emeritus.

Kenneth Lloyd Bullis, d.v.m. (Iowa State College), m.s. (University of Massachusetts), *Head of Department of Veterinary Science*, Emeritus.

Earle Stanton Carpenter, b.s. (University of Massachusetts), m.s. (Iowa State College), *Extension Professor of Agricultural Communications*, Emeritus.

Orton Loring Clark, b.s. (University of Massachusetts), *Associate Professor of Botany*, Emeritus.

Katherine Allen Clarke, a.b. (Goucher College), m.a. (Middlebury College), Docteur de l'Universite de Grenoble, *Professor of Romance Languages*, Emeritus.

Frederick Eugene Cole, b.s. (University of Massachusetts), *Extension Professor of Agricultural and Food Economics*, Emeritus.

James Wilson Dayton, b.s. (University of Massachusetts), *Associate Dean of Agriculture and Director of Extension Service*, Emeritus.

Paul Wheeler Dempsey, b.s. (University of Massachusetts), *Assistant Research Professor of Horticulture*, Emeritus.

Llewellyn Light Derby, b.s. (Springfield College), m.s. (University of Massachusetts), *Associate Professor of Physical Education*, Emeritus.

Lawrence Sumner Dickinson, b.s., m.s. (University of Massachusetts), *Professor of Agrostology*, Emeritus.

Walter Samuel Eisenmenger, b.s., m.s. (Bucknell University), a.m., ph.d. (Columbia University), *Research Professor of Agronomy*, Emeritus.

John Nelson Everson, b.s., m.s. (University of Massachusetts), *Assistant Professor of Agronomy*, Emeritus.

Clifford J. Fawcett, b.s. (Ohio State University), *Extension Professor of Animal Husbandry*, Emeritus.

F. Ethel Felton, a.b. (Smith College), *Experiment Station Editor*, Emeritus.

Oliver Simeon Flint, b.s. (University of Massachusetts), *Assistant Professor of Veterinary Science*, Emeritus.

May Estella Foley, b.s. (Michigan State University), m.a. (Columbia University), *Extension Professor of Home Economics*, Emeritus.

Charles Frederic Fraker, a.b. (Colorado College), a.m., ph.d. (Harvard University), *Professor of Romance Languages*, Emeritus.

Ralph Lyle France, b.s. (University of Delaware), m.s. (University of Massachusetts), *Professor and Head of Department of Bacteriology and Public Health*, Emeritus.

Arthur Perkins French, b.s. (Ohio State University), m.s. (University of Massachusetts), ph.d. (University of Minnesota), *Head of Department of Horticulture*, Emeritus.

James Everard Fuller, a.b., a.m. (Colorado College), ph.d. (Yale University), *Research Professor of Bacteriology*, Emeritus.

Mary Ellen Monica Garvey, b.s. (University of Massachusetts), *Associate Professor of Microbiology*, Emeritus.

Guy Victor Glatfelter, b.s. (Pennsylvania State University), m.s. (Iowa State College), *Placement Officer*, Emeritus.

Maxwell Henry Goldberg, b.s. (University of Massachusetts), m.a., ph.d. (Yale University), *Commonwealth Professor, University of Massachusetts*, Emeritus.

Harold Martin Gore, b.s. (University of Massachusetts), *Professor of Physical Education for Men*, Emeritus.

Emory Ellsworth Grayson, b.s. (University of Massachusetts), *Director of Placement*, Emeritus.

Emil Frederick Guba, b.s. (University of Massachusetts), ph.d. (University of Illinois), *Commonwealth Professor of Plant Pathology*, Emeritus.

Wellesley Carl Harrington, m.e. (Cornell University), *Extension Professor of Agricultural Engineering*, Emeritus.

Henri Darwin Haskins, b.s. (University of Massachusetts), *Research Professor of Agricultural Chemistry*, Emeritus.

Robert Dorman Hawley, b.s. (University of Massachusetts), m.b.a. (Boston University), *Treasurer*, Emeritus.

Mrs. Harriet Julia Haynes, b.s. (Columbia University), *Extension Professor of Home Economics*, Emeritus.

Frank Alfred Hays, b.s. (Oklahoma Agricultural College), m.a. (University of Nebraska), ph.d. (Iowa State College), *Research Professor of Poultry Husbandry*, Emeritus.

Robert Powell Holdsworth, b.s. (Michigan State University), m.f. (Yale University), *Professor of Forestry*, Emeritus.

Samuel Church Hubbard, *Assistant Professor of Floriculture*, Emeritus.

Horace Manfred Jones, b.s. (South Dakota State College), *Extension Professor of Youth Work*, Emeritus.

Linus Hale Jones, b.s., m.s. (University of Massachusetts), ph.d. (Rutgers), *Assistant Research Professor of Entomology and Plant Pathology*, Emeritus.

Gay Tetley Klein, b.s. (University of Missouri), m.s. (Kansas State College), *Extension Professor of Poultry Husbandry*, Emeritus.

Marshall Olin Lanphear, b.s., m.s. (University of Massachusetts), *Registrar*, Emeritus.

Mrs. N. May Larson, b.s. (University of Wisconsin), m.s. (Iowa State College), *Extension Professor of Home Economics*, Emeritus.

Harley Alanson Leland, b.s. (University of Vermont), *Extension Professor of Youth Work*, Emeritus.

Adrian Herve Lindsey, b.s. (University of Illinois), m.s., ph.d. (Iowa State College), *Professor of Agricultural Economics and Head of Department of Agricultural Economics and Farm Management*, Emeritus.

John Bailey Longstaff, b.s. (United States Naval Academy), m.s. (Pennsylvania State University), *Associate Professor of Mechanical Engineering*, Emeritus.

Hobart Hayes Ludden, b.b.a. (Boston University), *Business Manager*, Emeritus.

George Andrews Marston, B.S. in C.E., D.ENG. (Worcester Polytechnic Institute), M.S. (University of Iowa), *Dean, School of Engineering*, Emeritus.

H. Ruth McIntire, B.S. (Cornell University), *Professor of Home Economics (Extension Recreationist)*, Emeritus.

Frederick Adams McLaughlin, B.S. (University of Massachusetts), *Associate Professor of Botany*, Emeritus.

Oreana Alma Merriam, B.S. (University of Vermont), M.S. (University of Massachusetts), *Associate Professor of Home Economics*, Emeritus.

Helen Swift Mitchell, A.B. (Mount Holyoke College), PH.D. (Yale University), *Dean of the School of Home Economics*, Emeritus.

Frank Cochrane Moore, A.B. (Dartmouth College), *Professor of Mathematics*, Emeritus.

Roy Edgar Moser, B.S. (Ohio State University), M.S. (Cornell University), *Extension Professor of Agricultural Economics and Farm Management*, Emeritus.

Willard Anson Munson, B.S., D.AGR. (University of Massachusetts), *Director of Extension Service*, Emeritus.

Earle Harrison Nodine, B.S. (University of Connecticut), M.ED. (Springfield College), *Associate Professor of Youth Work*, Emeritus.

Grunow Otto Oleson, B.S., M.S. (University of Wisconsin), *Extension Professor of Communications*, Emeritus.

Robert Brown Parmenter, B.S.F. (University of Maine), *Extension Professor of Forestry*, Emeritus.

Charles Adams Peters, B.S. (University of Massachusetts), PH.D. (Yale University), *Professor of Chemistry*, Emeritus.

Wallace Frank Powers, A.B., A.M., PH.D. (Clark College), *Professor of Physics and Head of Department*, Emeritus.

Ernest James Radcliffe, M.B., M.D. (University of Toronto), *Senior Physician*, Emeritus.

Frank Prentice Rand, A.B. (Williams College), A.M. (Amherst College), L.H.D. (University of Massachusetts, Williams College), *Professor of English*, Emeritus.

Victor Arthur Rice, B.S. (North Carolina State College), M.AGR. (University of Massachusetts), D.AGR. (North Carolina State College), *Professor of Animal Husbandry*, Emeritus.

Joseph Harry Rich, B.S., M.F. (New York State College of Forestry), *Professor of Forestry*, Emeritus.

Walter Stuntz Ritchie, B.S. (Ohio State College), A.M., PH.D. (University of Missouri), *Goessmann Professor of Chemistry*, Emeritus.

Oliver Cousens Roberts, B.S. (University of Massachusetts), M.S. (University of Illinois), *Associate Professor of Pomology*, Emeritus.

David Rozman, B.A., M.A. (University of Wisconsin), PH.D. (Northwestern University), *Research Professor of Agricultural and Food Economics*, Emeritus.

William Crocker Sanctuary, B.S., M.S. (University of Massachusetts), *Professor of Poultry Husbandry*, Emeritus.

Ruth Evelyn Sherburne, B.S. (Simmons College), *Instructor of Agricultural and Food Economics*, Emeritus.

Dale Harold Sieling, B.S., M.S. (Kansas State College), PH.D. (Iowa State College), *Dean of the College of Agriculture, Director of the Experiment Station and Director of Extension Service*, Emeritus.

Grant Bingeman Snyder, B.S.A. (University of Toronto), M.S. (Michigan State University), *Head, Department of Horticulture*, Emeritus.

William Henry Tague, B.S. (Iowa State College), *Assistant Professor of Agricultural Engineering*, Emeritus.

Charles Hiram Thayer, B.AGR. (University of Massachusetts), *Assistant Professor of Agronomy*, Emeritus.

Clark Leonard Thayer, b.s. (University of Massachusetts), *Professor and Head of Department of Floriculture*, Emeritus.

Wilbur Herman Thies, b.s., m.s. (Michigan State University), *Extension Professor of Pomology*, Emeritus.

Jay R. Traver, b.a., m.a., ph.d. (Cornell University), *Professor of Zoology*, Emeritus.

Reuben Edwin Trippensee, b.s. (Michigan State University), m.s., ph.d. (University of Michigan), *Professor of Forestry and Wildlife Management*, Emeritus.

Roland Hale Verbeck, b.s. (University of Massachusetts), *Director of Short Courses*, Emeritus.

William Gould Vinal, b.s., m.a. (Harvard University), ph.d. (Brown University), *Professor of Nature Education*, Emeritus.

John Henry Vondell, *Associate Professor of Poultry Science*, Emeritus.

Mrs. Anne Williams Wertz, a.b. (Connecticut College), ph.d. (University of Massachusetts), *Commonwealth Professor, Research, Home Economics*, Emeritus.

George William Westcott, b.s., m.s. (Iowa State College), m.p.a., d.p.a. (Harvard University), *Professor of Agricultural and Food Economics*, Emeritus.

Harold Everett White, b.s., m.s. (Purdue University), *Professor, Research, Horticulture*, Emeritus.

Faculty of Resident Instruction

John William Lederle, a.b., a.m., ll.b., ph.d. (University of Michigan), ll.d. (Hon., Amherst College), litt.d. (Hon., Holy Cross College), ll.d. (Hon., Hokkaido University, Japan), *President.*

Leo Franklyn Redfern, a.b., m.a. (University of New Hampshire), m.p.a., ph.d. (Harvard University), *Acting Secretary of the University.*

Herschel George Abbott, b.s. (University of Maine), m.f., m.a. (Harvard University), *Associate Professor of Forestry and Wildlife Management.*

Doris Elizabeth Abramson, b.a. (University of Massachusetts), m.a. (Smith College), *Assistant Professor of Speech.*

Narastmhan Adinarayanan, b.v.s. (Principal Madras Veterinary College), Post Graduate in Physiopathology (Indian Veterinary Research Institute, Izatnagar), b.s. (Kansas State University). *Instructor, Research, Veterinary Science.*

George Nicholaos Agrios, b.s. (University of Thessaloniki, Greece), ph.d. (Iowa State University), *Assistant Professor of Entomology & Plant Pathology.*

Domenico B. Aliberti, b.a. (Ginnasio G. LaFarina, Castroreale, Italy), m.a. (Liceo Luigi Valli, Barcellona, Italy), *Doctor of Letters* (University of Messina), *Instructor in Romance Languages.*

Donald Pearson Allan, b.a. (University of Massachusetts), *Administrative Assistant to the Dean, College of Agriculture.*

Luther Alfred Allen, a.b. (Williams College), m.a. (State University of Iowa), ph.d. (University of Chicago), *Assistant Professor of Government.*

Stephen Ives Allen, a.b. (Amherst College), a.m. (Harvard University), *Assistant Professor of Mathematics.*

Doric Alviani, mus.b., ed.m. (Boston University), d.s.m. (Union Theological Seminary), *Professor of Music and Head of Department.*

Allen Emil Andersen, a.b., m.a. (University of Nebraska), ph.d. (Harvard University), *Professor of Mathematics.*

*Donald Lindsay Anderson, b.s. (University of Massachusetts), m.s. (University of Connecticut), ph.d. (Cornell University, *Associate Professor, Research, Poultry Science.*

Everett Anderson, b.a., m.a. (Fisk University), ph.d. (State University of Iowa), *Professor of Zoology.*

James Franklin Anderson, b.s., m.s. (West Virginia University), *Instructor in Horticulture.*

John William Anderson, b.s., m.b.a. (Indiana University), c.p.a. (Maine), *Associate Professor of Accounting and Chairman of Department.*

Thomas Joseph Andrews, b.s. (University of Massachusetts), a.m. (Williams College), *Assistant Professor of Zoology.*

Albert Stephen Anthony, b.s. (Trinity College), m.a.t., ed.d. (Harvard University), *Professor of Education.*

Norman Araujo, b.a. (Harvard College), m.a., ph.d. (Harvard University), *Assistant Professor of Romance Languages (Portuguese).*

Mrs. Marian Whitney Archibald, b.a. (Radcliffe College), *Instructor in Physical Education.*

Albert Wesley Aykroyd, b.s. (University of Massachusetts), Colonel USA, *Professor of Military Science and Head of Department.*

Alfonso Gil Azpeitia, m.s., ph.d. (University of Madrid), *Professor of Mathematics.*

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*On leave 1964–65

THEODORE SPAULDING BACON, JR., B.A. (Amherst College), M.C.P. (Massachusetts Institute of Technology), *Associate Professor of Landscape Architecture.*

JOHN SEARLS BAILEY, B.S. (Michigan State University), M.S. (Iowa State College), *Associate Professor, Research, Horticulture.*

JOHN HOWARD BAKER, B.S. (University of Massachusetts), M.S., PH.D. (Cornell University), *Assistant Professor, Research, Agronomy.*

EDWARD ALLAN BAMBER, B.S. (University of New Hampshire), Major, USAF, *Assistant Professor of Air Science.*

WALTER MILLER BANFIELD, B.S. (Rutgers University), PH.D. (University of Wisconsin), *Assistant Professor of Entomology and Plant Pathology.*

RALPHAELLA M. BANKS, B.A., M.A. (Syracuse University), *Instructor in Home Economics.*

ARLAN FREDERICK BARBER, B.S. (Springfield College), M.A. (Michigan State University), *Instructor in Physical Education.*

LEON OSER BARRON, B.A. (University of Massachusetts), M.A. (University of Minnesota), PH.D. (Harvard University), *Assistant Professor of English.*

LAWRENCE MATTHEWS BARTLETT, B.S., M.S. (University of Massachusetts), PH.D. (Cornell University), *Professor of Zoology*

MAURICE EDWARD BATES, B.S.E. in M.E. (University of Michigan), S.M. (Massachusetts Institute of Technology), PH.D. (University of Michigan), *Professor of Mechanical Engineering.*

CARLTON L. BEAL, JR., B.S. (Springfield College), *Instructor in Physical Education.*

JAMES RICHARD BEATTIE, B.S., M.S. (University of New Hampshire), *Extension Professor, and Associate Director of Extension Service.*

WILLIAM BERNARD BECKER, B.S. (New York State College of Forestry), M.S., PH.D. (University of Massachusetts), *Associate Professor, Research, Entomology and Plant Pathology.*

ROBERT EGNER BEITZELL, B.A. (Wesleyan University), M.A. (Columbia University), *Instructor in History.*

JOHN BELCK, B.S. (Boston University), *Instructor in Agricultural Communications.*

ELLSWORTH WILLIAM BELL, B.S. (Pennsylvania State University), M.S. (University of Vermont), *Extension Professor of Agricultural Economics.*

CARL IRVIN BELZ, B.A., M.F.A., PH.D. (Princeton University), *Instructor in Art.*

STANLEY MICHAEL BEMBEN, B.S. in C.E. (University of Massachusetts), M.S. in C.E. (University of Illinois), *Assistant Professor of Civil Engineering.*

EMMETT BENNETT, B.S. (Ohio State University), M.S. (University of Massachusetts), PH.D. (Pennsylvania State University), *Professor, Research, Forestry and Wildlife Management.*

DONALD ARTHUR BENZ, B.E. (Wisconsin State College), M.A. (Peabody College), *Assistant Professor of Education.*

BERNARD GERALD BERENSON, B.A. (American University), M.A., PH.D. (University of Maryland), *Assistant Director of Guidance and Associate Professor of Psychology.*

RICHARD EARL BERGQUIST, B.S. (University of Massachusetts), M.A. (University of Maryland), *Assistant Professor of Physical Education.*

WINFRED BERNHARD, B.S. (Harvard College), M.A., PH.D. (Columbia University), *Assistant Professor of History.*

RENE MARCEL BERNASCONI, B.A. (McGill University), M.S. (Tufts University), *Instructor in Chemistry.*

LOREN PETER BETH, A.B. (Monmouth College), M.A., PH.D. (University of Chicago), *Acting Head, Department of Government.*

GILBERT WILLIAM BETT, B.S., M.S., E.E. (Massachusetts Institute of Technology), *Associate Professor of Electrical Engineering.*

MARIO J. A. BICK, B.A. (Columbia University), *Instructor in Sociology & Anthropology.*

PHILLIPS R. BIDDLE, B.S. (Portland State College), A.M. (University of Illinois), *Instructor in Speech.*

HOWARD ELSON BIGELOW, A.B., M.A. (Oberlin College), PH.D. (University of Michigan), *Associate Professor of Botany.*

DAVID CANBY BISCHOFF, B.S., PH.D. (Pennsylvania State College), M.ED. (University of North Carolina), *Associate Professor of Physical Education.*

CHARLES R. BISSEY, B.S. (Colorado State University), M.ARCH. (Kansas State University), *Assistant Professor of Mechanical Engineering.*

DONALD LEIGHTON BLACK, B.S. (University of Maine), M.S., PH.D. (Cornell University), *Associate Professor, Research, Dairy and Animal Science.*

WALLACE GORDON BLACK, B.S., M.S., PH.D. (University of Wisconsin), *Professor, Research, Dairy and Animal Science.*

JOHN LEROY BLACKMAN, B.A. (Haverford College), M.A., PH.D. (Harvard University), *Associate Professor of Economics.*

JOHN BLACKMORE, B.S. (Washington State College), M.S. (University of Maryland), M.P.A., PH.D. (Harvard University), *Head of Department of Agricultural and Food Economics.*

MATTHEW LOUIS BLAISDELL, B.S. (University of Massachusetts), *Staff Associate, Research and Production Service.*

DAVID MICHAEL BLOOM, B.A. (Columbia University), M.A., PH.D. (Harvard University), *Assistant Professor of Mathematics.*

PAUL FREDERICK BOBULA, B.S. (University of Massachusetts), M.S. (Ohio State University), *Instructor, Research, Landscape Architecture.*

ELOISE JEAN BOGGS, A.B. (Glenville State College, West Virginia), M.S. (University of Massachusetts), *Instructor in Microbiology.*

ALFRED WORDEN BOICOURT, B.S., M.S. (Cornell University), *Professor, Program Leader, Coordinator in Floriculture.*

ROBERT SUMNER BOND, B.S. (University of Massachusetts), M.F. (Yale University), *Assistant Professor of Forestry and Wildlife Management.*

MARVIN WALTER BOSS, B.S. (Iowa State College), M.ED. (University of Maryland), *Associate Extension Professor, 4-H.*

HAROLD L. BOUDREAU, A.B., A.M. (University of Illinois), *Assistant Professor of Romance Languages.*

HAROLD DANFORTH BOUTELLE, B.S. in C.E. (Worcester Polytechnic Institute), *Associate Professor of Mathematics.*

RICHARD ELI BOWEN, B.A. (University of Kansas), B.S., M.S., D.V.M. (Kansas State University), *Instructor, Research, Veterinary Science.*

WILLIAM WELCH BOYER, B.S. in C.E., M.S. in C.E. (North Carolina State College), *Associate Professor of Civil Engineering.*

MRS. FRESIA MUNOZ BRADFORD, BACHILLER EN LETRAS, PROFESORA (Universidad de Chile), *Instructor in Romance Languages (Spanish).*

JOHN HOWARD BRAGG, B.S., M.S. (University of Maine), *Assistant Extension Professor of Agriculture and Food Economics.*

JOHN FREDERICK BRANDTS, B.A. (Miami University, Ohio), PH.D. (University of Minnesota), *Assistant Professor of Chemistry.*

GERARD BRAUNTHAL, B.A. (Queens College), M.A. (University of Michigan), PH.D. (Columbia University), *Associate Professor of Government.*

EVANGEL BREDAKIS, B.S. (Agricultural College, Athens, Greece), M.S. (University of Massachusetts), *Instructor, Research, in Agronomy.*

JOHN A. BRENTLINGER, A.B. (University of Chicago), M.A., PH.D. (Yale University), *Instructor in Philosophy.*

LAWRENCE ELLIOTT BRIGGS, B.S., M.S. (University of Massachusetts), *Professor of Physical Education.*

HOWARD O. BROGAN, B.A. (Grinnell College), M.A. (University of Iowa), PH.D. (Yale University), *Commonwealth Head of Department of English.*

MAURICE GUY BROSKY, B.A. (Elon College), M.ED. (Pennsylvania State University), *Instructor in Physical Education.*

Alfred Alexander Brown, b.s., m.s. (University of Massachusetts), *Professor, Research, Agricultural and Food Economics.*

Robert Bidwell Bruce, b.s. (University of Connecticut), m.s. (University of Vermont), *Assistant Professor, Research, Dairy and Animal Science.*

Ernest Mauro Buck, b.s. (University of Connecticut), m.s. (North Carolina State College), *Assistant Professor of Dairy and Animal Science.*

Milton Budoff, m.a., ph.d. (University of Chicago), *Assistant Professor of Psychology.*

Radie Harold Bunn, b.s. (South Dakota State College), *Associate Extension Professor of Agricultural Communications.*

Javier Bunuel, i.a. (City of University of Madrid, Spain), m.s. (University of Chicago), *Instructor in Mathematics.*

George Jerzy Burak, b.s.c., m.a. (University of Iowa), *Assistant Professor of Business Law and Real Estate.*

Terence Burke, b.a. (University of Birmingham, England), *Assistant Professor of Geography.*

Joseph Dowell Burroughs, b.s. (University of Virginia), m.s. (Cornell University), *Extension Professor of Home Economics.*

Kenneth R. Burstein, b.a. (Boston University), ph.d. (Duke University), *Assistant Research Psychologist.*

Frederick Allen Busi, b.a. (American International College), m.a. (University of Connecticut). *Instructor in Romance Languages.*

Bernard Philip Bussel, b.s. (University of Massachusetts), m.a. (Columbia University), *Instructor in Mathematics.*

Norman Wesley Butterfield, b.s. (University of Massachusetts), m.s., ph.d. (Purdue University), *Extension Professor of Horticulture.*

Evelyn Mable Byrne, b.s., m.s. (Simmons College School of Nursing), *Assistant Professor of Public Health Nursing.*

Robert Lee Byrne, Jr., b.s. (Ohio University), m.s. (Kent State University), ed.d. (George Peabody College), *Assistant Professor of Education.*

Marion Frances Cahill, b.s. (Johns Hopkins University), m.a. (Columbia University), *Instructor in Nursing.*

*Theodore Cuyler Caldwell, b.a. (College of Wooster), a.m. (Harvard University), ph.d. (Yale University), *Professor of History.*

Richard Lawrence Call, b.a. (University of Vermont), m.a. (Dartmouth College), *Instructor in Mathematics.*

James William Callahan, b.s., m.s. (University of Massachusetts), *Assistant Professor of Agricultural and Food Economics.*

Franklin James Campbell, b.s. (Pennsylvania State University), *Assistant Professor, Research, Horticulture.*

Marie Campbell, b.a. (Southern Illinois University), m.a. (George Peabody College), ph.d. (Indiana University), *Associate Professor of English.*

Ercole Canale-Parola, b.s., m.s., ph.d. (University of Illinois), *Assistant Professor of Microbiology.*

George Wesley Cannon, b.a. (Dakota Wesleyan University), m.s., ph.d. (University of Illinois), *Professor of Chemistry.*

Milton Cantor, b.a. (Brooklyn College), m.a. (University of Pennsylvania), ph.d. (Columbia University), *Assistant Professor of History.*

Thomas Merrit Carhart, b.s. (University of Alabama), Colonel, USAF, *Professor of Air Science and Head of Department of Air Science.*

Louis Albert Carpino, b.s. (Iowa State College), m.s., ph.d. (University of Illinois), *Associate Professor of Chemistry.*

Charles Ellsworth Carver, Jr., b.s. (University of Vermont), m.s., sc.d. (Massachusetts Institute of Technology), *Professor of Civil Engineering.*

*Harold Whiting Cary, a.b. (Williams College), a.m. (Harvard University), ph.d. (Yale University), *Professor of History.*

---

*On leave 1964–65

Kenneth Delbert Cashin, b.s. in ch.e., m.s. in ch.e. (Worcester Polytechnic Institute), ph.d. (Rensselaer Polytechnic Institute), *Professor of Chemical Engineering.*

Cosmo Anthony Catalano, a.b. (Allegheny College), m.f.a. (Yale University), *Assistant Professor of Speech.*

Sebastian Cavallaro, b.s., m.s. (University of Massachusetts), *Instructor, Research, Agricultural and Food Economics.*

Alfred Donald Caven, b.s. (University of Kentucky), m.l.a. (Harvard University), *Assistant Professor of Landscape Architecture.*

Jules Chametzky, b.a. (Brooklyn College), m.a., ph.d. (University of Minnesota), *Assistant Professor of English.*

Frederick Barker Chandler, b.s. (University of Maine), ph.d. (University of Maryland), *Professor, Research, Agronomy.*

John Allard Chandler, b.s. (Ohio University), m.s., ph.d. (University of Illinois), *Assistant Professor of Chemistry.*

Ganesar Chanmugam, b.s. (University of Ceylon), b.a. (Cambridge University), *Instructor in Physics.*

Clifford Spencer Chater, b.s. (University of Rhode Island), m.s. (Kansas State College), *Assistant Professor, Research, Entomology and Plant Pathology.*

Muhammad Iqbal Chaudhry, Law degree (Law College at Lahore), m.a. (Punjab University), m.a. (Harvard University), *Instructor in Economics.*

Ronald Mitchell Check, b.s. (University of Rhode Island), *Instructor, Research, Feed and Fertilizer.*

Pao Lun Cheng, b.s. (National Chiao Tung University, Shanghai, China), m.a. (University of Missouri), ph.d. (University of Wisconsin), *Professor of Finance.*

Mrs. Miriam Usher Chrisman, b.a., m.a. (Smith College), m.a. (American University), ph.d. (Yale University), *Instructor in History.*

David Ridgley Clark, b.s. (Wesleyan University), m.a., ph.d. (Yale University), *Associate Professor of English.*

Sidney Johnson Claunch, Jr., a.b. (Ohio University), m.a., ph.d. (University of Wisconsin), *Associate Professor of Management.*

David MacDowell Clay, b.a. (Swarthmore College), m.a. (Princeton University), *Instructor in Philosophy.*

Joe Todd Clayton, b.s. in a.e. (University of Tennessee), m.s. in a.e. (University of Illinois), ph.d. (Cornell University), *Professor, Research, Agricultural Engineering.*

Ambrose Augustine Clegg, Jr., b.a. (St. John's College), m.a. (Columbia University), ph.d. (University of North Carolina), *Assistant Professor of Education.*

Richard Bernard Close, b.a. (University of Pittsburgh), m.a. (University of Massachusetts), Captain, USAF, *Assistant Professor of Air Science.*

Justin Lyman Cobb, b.s. (Springfield College), m.ed. (Pennsylvania State College), *Assistant Professor of Physical Education.*

Cecil Earl Cody, Jr., b.a., m.a. (University of Nebraska), ph.d. (University of Washington), *Assistant Professor of History.*

Sol Cohen, b.a. (City College of the City of New York), m.a., ph.d. (Teachers College, Columbia University), *Assistant Professor of Education.*

Byron Earl Colby, b.a. (University of New Hampshire), m.s. (Michigan State University), *Extension Professor of Dairy and Animal Science.*

William George Colby, b.s.a. (University of Illinois), m.s., ph.d. (Rutgers University), *Professor of Agronomy and Head of Department.*

Dan Stead Collins, b.s. (University of Pennsylvania), m.a., ph.d. (University of North Carolina), *Assistant Professor of English.*

William Hylton Collins, b.s., m.s. (Virginia Polytechnic Institute), *Assistant Professor, Research, Agricultural Engineering.*

Mary Frances Condron, b.s., m.s.n. (Catholic University of America, Washington, D. C.), *Assistant Professor of Nursing.*

John Thomas Conlon, b.b.a. (University of Massachusetts), m.a. (University of Connecticut), ph.d. (Michigan State University), *Associate Professor of Management and Chairman of Department and Assistant Dean, School of Business Administration.*

Joseph Contino, b.mus. (Oberlin College), m.a. (Columbia University), *Assistant Professor of Music.*

Mrs. Gladys Mae Cook, b.s. (Battle Creek College), m.s. (University of Massachusetts), *Associate Professor of Home Economics.*

Mrs. Marjorie M. Cook, b.a. (Barnard College), m.s. (Wellesley College), *Instructor in Mathematics.*

*Thomas Wellsted Copeland, b.a., ph.d. (Yale University), *Commonwealth Professor of English.*

Armand Joaquin Costa, b.a. (American International College), m.s. (University of Massachusetts), *Assistant Professor of Mechanical Engineering.*

John Joseph Coughlin, Jr., b.f.a., m.s. (Rhode Island School of Design), *Instructor in Art.*

*Norman Gerard Cournoyer, ll.b. (American University), m.b.a. (University of Massachusetts), *Assistant Professor of Food Science and Technology.*

Charles D. Cox, b.s., m.s., ph.d. (University of Illinois), *Commonwealth Head of Department of Microbiology.*

Benjamin Charles Crooker, Jr., b.s. (University of Massachusetts), *Instructor in Physics.*

*Chester Ellsworth Cross, b.s., m.s. (University of Massachusetts), ph.d. (Harvard University), *Professor, Research, Head of Cranberry Station.*

*Bradford Dean Crossmon, b.s., m.s., (University of Connecticut), m.p.a. (Harvard University), *Extension Professor of Agricultural and Food Economics.*

Genevieve M. Crowley, b.s., m.s. (Boston University), *Assistant Professor of Psychiatric Nursing.*

Helen Frances Cullen, a.b. (Radcliffe College), m.a., ph.d. (University of Michigan), *Associate Professor of Mathematics.*

David James Curran, b.s. (University of Massachusetts), m.s. (Boston College), ph.d. (University of Illinois), *Assistant Professor of Chemistry.*

Reynold Bernard Czarnecki, b.s. (Pennsylvania State University), m.s., ph.d. (University of Illinois), *Assistant Professor of Microbiology.*

Verda Mae Dale, b.s. (Kansas State College), m.s. (Cornell University), *Extension Professor of Home Economics.*

Margaret Min Damm, b.f.a. (Oklahoma State University), m.a. (University of Michigan), *Instructor in Art.*

Richard A. Damon, Jr., b.s. (University of Massachusetts), m.s., ph.d. (University of Minnesota), *Associate Director, Massachusetts Experiment Station and Biometrician, College of Agriculture.*

Suzanne Catherine Danahar, b.a. (College of New Rochelle), m.a. (Fordham University), *Instructor in Romance Languages.*

Alan Davis, b.a., m.a. (Harvard University), *Instructor in German-Russian.*

Dorothy Davis, b.s. (Syracuse University), m.a. (Columbia University), *Associate Professor of Home Economics.*

Edward Lyon Davis, a.b. (Harvard University), m.s. (University of Massachusetts), ph.d. (Washington University), *Associate Professor of Botany.*

Virginia Davis, b.s. (Skidmore College), m.s. (Pennsylvania State University), *Associate Extension Professor of Home Economics.*

William Allen Davis, b.a. (Colgate University), a.m., ph.d. (Harvard University), *Associate Professor of History.*

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*On leave 1964–65

Robert William Day, b.s. in m.e. (University of Massachusetts), m.m.e. (Rensselaer Polytechnic Institute), *Associate Professor of Mechanical Engineering.*

John Joseph Delaney, b.s. (University of Cincinnati), *Assistant Professor of Physical Education and Athletic Coach.*

Irving Demoranville, b.s., m.s. (University of Massachusetts), *Assistant Professor, Research, Cranberry Station.*

John William Denison, b.s. (University of Maine), *Extension Instructor in Poultry Science.*

Carl Dennler, Jr., b.s., m.a. (University of Missouri), ph.d. (University of Wisconsin), *Associate Professor of Accounting.*

Mario S. DePillis, b.a., m.a., (University of Chicago), ph.d. (Yale University), *Assistant Professor of History.*

David James Dickinson, b.s. (University of Denver), m.a. (Columbia University), ph.d. (University of Michigan), *Associate Professor of Mathematics.*

Thomas Pancoast Dilkes, b.a. (New York State University), m.a. (New York University), *Instructor in History.*

Gellestrina Teresa DiMaggio, a.b. (Connecticut College for Women), m.a. (Columbia University), m.n. (Yale University), *Associate Professor of Maternal and Child Nursing.*

John Harland Dittfach, b.s. in m.e., m.s. in m.e. (University of Minnesota), *Professor of Mechanical Engineering.*

Martin Dolch, ph.d. (University of Marburg, Germany), *Visiting Lecturer in German.*

Elwyn John Doubleday, b.s., m.ed. (University of Massachusetts), *Department Head, Education, Uganda Project.*

John George Douglas, Jr., b.s. (State Teachers College, Lock Haven, Pennsylvania), m.s. (Springfield College), *Instructor in Physical Education.*

Mack Drake, b.s., m.s., ph.d. (Purdue University), *Professor, Research, Agronomy.*

Robert George Drew-Bear, a.b., m.b.a. (Harvard University), *Assistant Professor of Marketing.*

Edwin Douglas Driver, a.b. (Temple University), m.a., ph.d. (University of Pennsylvania), *Associate Professor of Sociology.*

Mrs. Marron Shaw Dubois, b.a. (St. Lawrence University), *Instructor in English.*

Audrey Rosalind Duckert, b.s., m.a. (University of Wisconsin), ph.d. (Radcliffe College), *Assistant Professor of English.*

Hans Christian Duus, b.s. (Carleton College), ph.d. (Harvard University), *Associate Professor of Chemical Engineering.*

Ernest Dzendolet, b.s. in chemistry, b.s. in biology (California Institute of Technology), sc.m., ph.d. (Brown University), *Assistant Professor of Psychology.*

Frederick John Dzialo, b.s. in c.e., m.s. in c.e. (University of Massachusetts), *Assistant Professor of Civil Engineering.*

Basil Ralph Eastwood, b.s. (Wisconsin State Teachers College), m.s. (South Dakota State College), *Assistant Extension Professor of Dairy and Animal Science.*

Winifred Isabel Eastwood, a.b. (Sterling College), m.a. (Columbia University), *Extension Professor and Head, Extension Division of Home Economics.*

Sherman Philip Eddy, b.a. in ed. (Nebraska State Teachers College), m.a. Teachers College, Columbia University), *Assistant Professor of Education.*

Frederick Horton Edwards, b.a.sc. (University of British Columbia), m.a.sc. (Nova Scotia Technical College), *Associate Professor of Electrical Engineering.*

Gustave Adam Efroymson, a.b., a.m. (Harvard University), *Instructor in Mathematics.*

LEONARD H. EHRLICH, B.S. (Roosevelt University), M.A., PH.D. (Yale University), *Assistant Professor of Philosophy.*

CARL HENRY EIBEN, B.A. (Wartburg College), M.S. (State University of Iowa), *Assistant Professor, Research, Entomology and Plant Pathology.*

JOHN WILLIAM ELDRIDGE, B.S. in CH.E. (University of Maine), M.S. in CH.E. (Syracuse University), PH.D. in CH.E. (University of Minnesota), *Head of Department of Chemical Engineering.*

ARTHUR ELKINS, B.B.A. (University of Massachusetts), M.S. (Columbia University), *Assistant Professor of Management.*

FREDERICK CHARLES ELLERT, B.S. (University of Massachusetts), M.A. (Amherst College), PH.D. (Stanford University), *Professor of German and Head of German-Russian Department.*

NOLAN EUGENE ENGEL, B.S. (University of Nebraska,) M.S. (University of Connecticut), *Assistant Extension Professor of Agricultural and Food Economics.*

SEYMOUR EPSTEIN, B.A. (Brooklyn College), M.A., PH.D. (University of Wisconsin), *Professor of Psychology.*

CHARLES EDGAR ESHBACH, B.S. (University of Massachusetts), M P.A. (Harvard University), *Associate Extension Professor of Agricultural and Food Economics.*

WILLIAM BRIGHAM ESSELEN, B.S., M.S., PH.D. (University of Massachusetts), *Commonwealth Head of Department of Food Science and Technology.*

DAVID AUSTIN EVANS, B.S., M.S. (Pennsylvania State University), *Assistant Professor of Dairy and Animal Science.*

ROBERT REES EVANS, A.B. (Harvard College), M.A. (Brandeis University), *Instructor in History.*

GEORGE PETER FADDOUL, D.V.M. (Middlesex University), M.S. (University of New Hampshire), *Professor, Research, Veterinary Science.*

IRVING SEYMOUR FAGERSON, B.S. (Massachusetts Institute of Technology), M.S., PH.D. (University of Massachusetts), *Professor, Research, Food Science and Technology.*

DONALD FAIRBAIRN, B.A. (Queen's University), PH.D. (University of Rochester), *Commonwealth Head of Department of Zoology.*

*OSWALD CORNELL FARQUHAR, B.A., M.A. (Oxford University), PH.D. (University of Aberdeen), *Professor of Geology.*

ROBERT SIMON FELDMAN, B.S., M.S., PH.D. (University of Michigan), *Professor of Psychology.*

GORDON WALLACE FELLOWS, A.B. (University of Connecticut), *Assistant Professor, Research, Veterinary Science.*

TSUAN HUA FENG, B.S. in C.E. (National Pei-Yang University), M.S., PH.D. (University of Wisconsin), *Professor of Civil Engineering.*

HEINRICH FENNER, M.S., PH.D. (Stuttgart-Hohenheim University), *Assistant Professor, Research, Dairy and Animal Science.*

JOHN HAROLD FENTON, B.A., M.A. (University of Kentucky), PH.D. (Harvard University), *Commonwealth Professor of Government.*

MRS. BERTHA ELEANOR FESSENDEN, B.S. (Simmons College), *Instructor in Chemistry.*

GERALD ARTHUR FITZGERALD, S.B. (Massachusetts Institute of Technology), *Extension Professor of Agricultural Engineering.*

JOHN ANTHONY FITZGERALD, B.S. in E.E. (Tufts University), M.S. (University of Massachusetts), *Associate Professor of Electrical Engineering.*

JOHN MAURICE FITZGERALD, B.S. (U. S. Merchant Marine Academy), B.B.A. (Southern Methodist University), M.A. (University of Connecticut), *Assistant Professor of Accounting.*

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*On leave 1964–65

ROBERT ALAN FITZPATRICK, B.S., M.S. (University of Massachusetts), *Associate Professor, Research, Agricultural and Food Economics.*

WILLIAM DOUGLAS FOLAND, A.B., M.S., PH.D. (University of Tennessee), *Associate Professor of Physics.*

RICHARD CAROL FOLEY, B.S., M.S. (University of Massachusetts), PH.D. (Rutgers University), *Professor of Dairy and Animal Science.*

WILLIAM FOOTRICK, B.S., M.P.E. (Springfield College), *Associate Professor of Physical Education.*

HERBERT C. FORDHAM, B.S. (Cornell University), *Extension Instructor in Horticulture.*

DAVID HARRY FORTIER, B.S. (Columbia University), *Assistant Professor of Sociology and Anthropology.*

JOHN HENRY FOSTER, B.S., PH.D. (Cornell University), M.S. (Purdue University), *Associate Professor of Agriculture and Food Economics.*

THOMAS SWEET FOSTER, B.S. (University of Massachusetts), *Instructor, Research Forestry and Wildlife Management.*

ROY FOWLER, B.S. (United States Military Academy), Captain, USA, *Assistant Professor of Military Science.*

THOMAS WALTON FOX, B.S., M.S. (University of Massachusetts), PH.D. (Purdue University), *Professor of Poultry Science and Head of Department.*

FREDERICK JOHN FRANCIS, B.A., M.A. (University of Toronto), PH.D. (University of Massachusetts), *Professor, Research, Food Science and Technology.*

PEGGY MARY FRANK, B.S., M.A. (New York University), *Instructor in Recreation.*

THOMAS MOTT FRASER, JR., A.B. (Harvard College), M.A., PH.D. (Columbia University), *Assistant Professor of Sociology and Anthropology.*

RONALD HAROLD FREDRICKSON, B.S. (Kansas State Teachers College), M.S., PH.D. (University of Wisconsin), *Assistant Professor of Education.*

MRS. GEORGIA PERKINS FRENCH, B.S., M.S. (University of Massachusetts), *Instructor, Research, Feed and Fertilizer.*

EARL INMAN FULLER, B.S., M.S. (Michigan State University), *Assistant Professor, Research, Agriculture and Food Economics.*

VICTOR FUSIA, B.S. (Manhattan College), *Professor of Physical Education and Head Football Coach.*

PAUL ADELARD GAGNON, B.A. (University of Massachusetts), M.A., PH.D. (Harvard University), *Assistant Professor of History.*

ROBERT WILLIAM GAILEY, B.S. (University of New Hampshire), Captain, USAF *Assistant Professor of Air Science.*

PHILIP LYLE GAMBLE, B.S., M.A. (Wesleyan University), PH.D. (Cornell University), *Professor of Economics.*

RICHARD FRANKLIN GARBER, B.S. (Springfield College), M.ED. (Pennsylvania State University), *Associate Professor of Physical Education.*

WILLIAM JAMES GARLAND, JR., *Instructor, Research, Entomology and Plant Pathology.*

HAROLD BAILEY GATSLICK, B.S., M.S., PH.D. (Syracuse University), *Professor of Forestry and Wildlife Management.*

STANLEY NEWKIRK GAUNT, B.S. (Rutgers University), PH.D. (North Carolina State College), *Extension Professor of Dairy and Animal Science.*

ANTHONY M. GAWIENOWSKI, B.S. (Villanova College), M.S., PH.D. (University of Missouri), *Associate Professor of Chemistry.*

LOUIS A. GEBHARD, JR., B.A., M.A. (Montclair State Teachers College), *Instructor in History.*

ARTHUR CHRISTOPHER GENTILE, B.S. (College of the City of New York), SC.M. (Brown University), PH.D. (University of Chicago), *Associate Professor of Botany.*

JOHN WARREN GEORGE, A.B. (Princeton University), M.A. (University of North Carolina), PH.D. (Massachusetts Institute of Technology), *Assistant Professor of Chemistry.*

*Edwin Andrus Gere, Jr., b.a. (Alfred University), m.a. (Pennsylvania State University), *Assistant Director, Bureau of Government Research.*

Bertram Gersten, b.s. (University of Rhode Island), m.s. (University of Massachusetts), *Assistant Professor, Research, Feed and Fertilizer.*

Constantine Joseph Gilgut, b.s., m.s. (University of Massachusetts), a.m., ph.d. (Harvard University), *Extension Professor of Entomology and Plant Pathology.*

Mary Elizabeth Gilmore, b.s. (Simmons College), m.s. (The Catholic University of America), *Professor of Nursing.*

Chester Stephen Gladchuk, b.s.ed. (Boston College), *Assistant Football Coach.*

Mrs. Elisabeth Charlette Gladir, m.a. (Columbia University), *Instructor in Russian.*

Frederick Joseph Glatz, b.s. (University of Pittsburgh), *Instructor in Physical Education and Assistant Athletic Coach.*

John Joseph Goda, Jr., b.s. in ch.e. (University of Massachusetts), *Instructor, Research, Computer Center.*

George Benjamin Goddard, b.s., ph.d. (University of Massachusetts), *Instructor in Horticulture.*

Stowell Coolidge Goding, a.b. (Dartmouth College), a.m. (Harvard University), ph.d. (University of Wisconsin), *Professor of Romance Languages.*

Morris Golden, b.a. (City College of New York), m.a., ph.d. (New York University), *Associate Professor of English.*

Meredith Ann Gonyea, b.s. (University of Massachusetts), *Instructor, Research, Computer Center.*

John Lake Goodyear, b.a., m.a. (University of Michigan), *Instructor in Art.*

Harold Jackson Gordon, Jr., b.a. (University of Richmond), m.a., ph.d. (Yale University), *Professor of History.*

Milton Myron Gordon, b.a. (Bowdoin College), m.a., ph.d. (Columbia University), *Professor of Sociology.*

*Albert Edward Goss, b.a., m.a., ph.d. (State University of Iowa), *Professor of Psychology.*

Raymond Dante Gozzi, a.b. (Amherst College), a.m. (Columbia University), ph.d. (New York University), *Assistant Professor of English.*

Gerald John Grady, b.a. (Lawrence College), m.a. (University of Chicago), *Business Manager.*

Robert L. Gray, b.s. (California State College), *Instructor in Physics.*

Frederick Greeley, b.a. (Kenyon College), m.a., ph.d. (University of Wisconsin), *Associate Professor of Forestry and Wildlife Management.*

*Louis Simpson Greenbaum, b.a., m.a. (University of Wisconsin), ph.d. (Harvard University), *Associate Professor of History.*

Sumner Melvin Greenfield, a.b. (Boston College), a.m. (Boston University), ph.d. (Harvard University), *Associate Professor of Romance Languages.*

Robert Morris Grover, b.s. (University of Vermont), m.s. (University of Massachusetts), *Assistant Extension Professor of Poultry Science.*

Thomas Augustus Grow, b.s. (University of Connecticut), m.s. (Virginia Polytechnic Institute), *Associate Professor of Civil Engineering.*

Alice Aline Guimond, b.a. (American International College), m.a. (University of Illinois), *Instructor in History.*

Julius Gundersheim, b.s. (State University of New York, Cortland), m.s. (Ohio University, Athens), *Instructor in Physical Education.*

Haim Bernard Gunner, b.s.a. (Ontario Agricultural College), m.sc. (University of Manitoba), ph.d. (Cornell University), *Assistant Professor, Research, Institute of Agricultural Microbiology, Agronomy, Food Science and Technology.*

Elaine Haddad, b.a. (University of Connecticut), m.a., ph.d. (University of Wisconsin), *Assistant Professor of Romance Languages.*

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*On leave 1964–65

Beverly Adele Hall, b.s. (Texas Christian University), m.s. (New York University), *Instructor in Psychiatric Nursing.*

Donald Eugene Hall, b.s. (Gorham Teachers College), ed.m. (Boston University), *Assistant Professor of Education.*

Tom Sherman Hamilton, Jr., b.f.a. (University of Illinois), m.s. (University of Massachusetts), *Assistant Professor of Landscape Architecture.*

Catherine Elizabeth Hanifan, b.a. (Mount Holyoke College), m.a. (Northwestern University), *Instructor in Speech.*

Denzel J. Hankinson, b.s. (Michigan State University), m.s. (University of Connecticut), ph.d. (Pennsylvania State University), *Professor of Dairy and Animal Science and Head of Department.*

John Francis Hanson, b.s., m.s., ph.d. (University of Massachusetts), *Associate Professor of Entomology and Plant Pathology.*

Harold Ernest Hardy, a.b. (Pomona College), ph.d. (University of Minnesota), *Professor of Marketing and Chairman of Department.*

*Dana Elbert Harlow, b.s. (University of West Virginia), m.s. (University of Illinois), ph.d. (University of Geneva), *Assistant Professor of Recreation.*

Richard Davis Harper, a.b. (University of Vermont), m.a., ph.d. (University of Wisconsin), *Assistant Professor of Speech.*

Denton Ballard Harris, b.s. in c.e., m.s. in c.e. (University of Massachusetts), *Assistant Professor of Civil Engineering.*

John Sharp Harris, b.s. (University of Richmond), m.a. (College of William and Mary), m.s. (Syracuse University), ph.d. (University of Chicago). *Commonwealth Professor of Government.*

William Kenneth Harris, d.v.m. (Ohio State University), *Professor, Research, Veterinary Science.*

Robert H. Harrison, a.b. (Oberlin College), m.s., ph.d. (Pennsylvania State University), *Assistant Professor of Psychology.*

William Royal Harvey, a.b. (Tufts University), b.ed. (Edinburgh University), a.m., ph.d. (Harvard University), *Associate Professor of Biology.*

Ronald Hauser, a.b., m.a., ph.d. (University of California), *Assistant Professor of German.*

John A. Haussler, Jr., b.a. (Siena College), m.s. (University of Massachusetts), *Instructor in Physics.*

Richard Haven, a.b. (Harvard University), m.a. (Princeton University), b.litt. (Oxford University), ph.d. (Princeton University), *Associate Professor of English.*

John Ralph Havis, b.s. (Texas Technical College), m.s., ph.d. (Cornell University), *Professor, Research, Horticulture.*

Sarah Louise Hawes, b.s. (Northern Michigan College of Education), m.s. (Cornell University), *Associate Professor of Home Economics.*

Kirby Maxwell Hayes, b.s., m.s. (University of Massachusetts), *Extension Professor of Food Science and Technology.*

M. M. Richard Hays, b.s. (College of the Pacific), m.s. (University of the Pacific), *Instructor in Physics.*

Inez Elizabeth Hegarty, a.b., a.m. (Mount Holyoke College), ph.d. (University of Wisconsin), *Associate Professor of Speech.*

*Peter Heller, b.a. (McGill University), m.a., ph.d. (Columbia University), *Commonwealth Professor of German.*

Vernon Parker Helming, b.a. (Carleton College), ph.d. (Yale University), *Professor of English.*

Karl Newcomb Hendrickson, b.s. in g.e., b.s. in c.e., m.s. in c.e. (University of Maine), *Professor of Civil Engineering.*

Herbert Alvin Herchenreder, b.s. in e.e. (University of Missouri), m.s. in e.e. University of Connecticut), *Assistant Professor of Electrical Engineering.*

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*On leave 1964–65

John Harland Hicks, b.a. (Middlebury College), m.a., ph.d. (Boston University), *Assistant Professor of English.*

Barbara Higgins, b.s. (University of Maine), m.s. (Cornell University), *Extension Professor of Home Economics.*

George Richardson Higgins, b.s. (University of New Hampshire), s.m. (Massachusetts Institute of Technology), *Associate Professor of Civil Engineering.*

Thomas Peter Hillman, b.a. (College of William and Mary), m.ed. (University of Maryland), ph.d. (University of Michigan), *Assistant Professor of Education.*

Bernard Lee Hilton, b.s. (University of Maine), *Farm Superintendent and Head of Farm Service.*

Robert Bruce Hoadley, b.s. (University of Connecticut), m.f., d. for. (Yale University), *Assistant Professor of Forestry and Wildlife Management.*

Mrs. Floriana Tarantino Hogan, b.s., a.m., ph.d. (Boston University), *Assistant Professor of English.*

Francis William Holmes, b.a. (Oberlin College), ph.d. (Cornell University), *Associate Professor, Research, Entomology and Plant Pathology.*

Bronislaw Mark Honigberg, a.b., m.a., ph.d. (University of California), *Professor of Zoology.*

Leonta Gertrude Horrigan, b.s. (University of Massachusetts), m.a. (Smith College), *Assistant Professor of English.*

Franklin Wu Houn, b.a. (National Cheng-chih University), m.a. (University of Denver), ph.d. (University of Wisconsin), *Associate Professor of Government.*

John Joseph Howard, Jr., b.s. (Rensselaer Polytechnic Institute), m.a. (University of Massachusetts), *Instructor in Economics.*

Marshall Chapman Howard, a.b. (Princeton University), ph.d. (Cornell University), *Professor of Economics.*

Mildred Louise Howell, b.s. (Buffalo State Teachers College), m.a. (Cornell University), *Associate Extension Professor, 4-H*

Merle Lee Howes, b.s. (Kansas State College), m.a. (University of Maryland), ph.d. (University of Wisconsin), *Professor and Head, Extension Division of Youth Work.*

Elisabeth Vickery Hubbard, b.s. (University of Wisconsin), m.a. (University of Chicago), m.ed. (Wayne State University), ed.d. (University of California, Los Angeles), *Associate Professor of Physical Education.*

Roderick Huff, b.s. (University of Minnesota), Major, USA, *Assistant Professor of Military Science.*

Charles Bryan Huggins, b.s. (Clemson College), Captain, USA, *Assistant Professor of Military Science.*

Herbert Oscar Hultin, b.s., m.s., ph.d. (Massachusetts Institute of Technology), *Associate Professor of Food Science and Technology.*

Isaac Moyer Hunsberger, b.s., m.s., ph.d. (Lehigh University), *Dean, College of Arts and Sciences.*

Ward Martin Hunting, b.s. (Houghton College), m.s. (University of Massachusetts), *Assistant Professor of Food Science and Technology.*

Angelo Iantosca, s.b. (Massachusetts Institute of Technology), *Visiting Lecturer in Public Health.*

*Vincent Ilardi, b.a. (Rutgers University), m.a., ph.d. (Harvard University), *Associate Professor of History.*

Robert Eugene Inman, b.a. (Wabash College), m.s., ph.d. (University of Nebraska), *Assistant Professor, Research, Entomology and Plant Pathology.*

Virginia Ann Irvine, b.s. (Gettysburg College), *Instructor in Physical Education.*

Henry George Jacob, b.e., m.e., ph.d. (Yale University), *Professor of Mathematics.*

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*On leave 1964–65

DONALD ROBERT JACOBS, B.S. (University of Massachusetts), M.S. (University of Wisconsin), *Instructor in Mathematics.*

PATRICIA JOANNE JAEGER, B.A., M.A., PH.D. (University of Minnesota), *Assistant Professor of Romance Languages.*

*ROBERT JOSEPH JAMES, B.S., M.S. (Springfield College), *Assistant Professor of Physical Education.*

HAROLD JARMON, A.B. (New York University), M.A., PH.D. (University of Kansas), *Assistant Professor of Clinical Psychology.*

MRS. AINO JARVESOO, M.S. (University of Massachusetts), *Instructor in Home Economics.*

ELMAR JARVESOO, AGR. DIP., MAG. AGR. (Tartu University), DR. AGRI. (Berlin University), *Assistant Professor, Research, Agricultural and Food Economics.*

FRED PAINTER JEFFREY, B.S. (Pennsylvania State University), M.S. (University of Massachusetts), *Associate Dean of the College of Agriculture and Director of the Stockbridge School.*

JOHN ALLAN JENKINS, B.MUS., M.MUS. (University of Michigan), *Assistant Professor of Music and Director of Bands.*

RANDOLPH ANTHONY JESTER, B.S. (Virginia Polytechnic Institute), M.S. (Rutgers University), *Assistant Professor of Horticulture.*

CURTIS ALLEN JOHNSON, B.SC. (University of Nebraska), M.SC. (Iowa State College), *Associate Extension Professor of Agricultural Engineering.*

ERNEST AVERY JOHNSON, B.S. (University of Massachusetts), M.S. (Purdue University), *Assistant Professor of Agricultural Engineering.*

LAWRENCE ALEXANDER JOHNSON, B.S. in B.A., M.B.A. (Boston University), *Assistant Professor of Marketing.*

ROBERT BROWN JOHNSON, A.B. (Ohio University), M.A., PH.D. (University of Wisconsin), *Professor of Romance Languages.*

THURLO FRANCIS JOHNSON, B.B.A., M.B.A. (University of Toledo), *Assistant Professor of Management.*

MRS. ROSA STARKEY JOHNSTON, B.S. (Nasson College), *Assistant Extension Professor of Home Economics.*

CLIFFORD VINTON JONES, B.S. (Edinboro State College), M.ED. (University of Pittsburgh), ED.D. (Columbia University), *Professor of Education.*

PHILLIPS RUSSELL JONES, B.S. (University of Massachusetts), M.A., PH.D. (University of Connecticut), *Associate Professor of Physics.*

ROBERT CARROLL JONES, B.S. (University of Maine), M.S. (University of Massachusetts), ED.D. (Cornell University), *Assistant Professor of Education.*

HOMER VIRTES JUDGE, B.A., M.A. (Oklahoma State University), PH.D. (Michigan State University), *Assistant Professor of Education.*

JANE JUDGE, B.A. (Mt. Holyoke College), M.A. (Smith College), PH.D. (University of Massachusetts), *Instructor in Chemistry.*

WALTER KAMYS, Diploma (School of the Art Institute of Chicago), *Assistant Professor of Art.*

IK-JU KANG, A.B., B.S. (Yonsei University, Korea), PH.D. (Northwestern University), *Assistant Professor of Physics.*

*SIDNEY KAPLAN, B.A. (College of the City of New York), M.A. (Boston University), PH.D. (Harvard University), *Professor of English.*

SOLIS LEIGHTER KATES, B.S., M.A. (College of the City of New York), PH.D. (Columbia University), *Professor of Clinical Psychology.*

SIDNEY WILLIAM KAUFFMAN, B.S., M.ED. (Springfield College), *Professor of Physical Education and Head, Department of Physical Education for Men.*

BARBARA ANNE KAY, B.A., M.A., PH.D. (Ohio State University), *Assistant Professor of Sociology.*

DANIEL KEEDY, B.S. (American International College), M.S. (University of Massachusetts), *Instructor in Chemistry.*

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*On leave 1964–65

John Graham Keliher, B.A. (University of California), Captain, USA, *Assistant Professor of Military Science.*

Robert Lee Kent, Jr., B.S., M.L.A. (Michigan State University), *Assistant Professor of Landscape Architecture.*

Simon V. Keochakian, B.S., M.S. (Springfield College), *Instructor in Guidance.*

*Stanley Kertzner, A.B. (Cornell University), SC.M. (Brown University), *Assistant Professor of Mathematics.*

Carl Anton Keyser, B.S. (Carnegie Institute of Technology), B.S., M.S. (Worcester Polytechnic Institute), *Commonwealth Professor of Mechanical Engineering.*

Emelia Louise Kilby, B.S. (Mary Washington College), M.A. (New York University), PH.D. (University of Washington), *Instructor in Physical Education.*

Eleanor Killam, B.S., M.S. (University of New Hampshire), PH.D. (Yale University), *Assistant Professor of Mathematics.*

Clarence Wendell King, B.A., M.A., PH.D. (Yale University), *Professor of Sociology.*

Gordon Stephenson King, B.S. (Michigan State University), M.S. (University of Massachusetts), *Professor, Research, Landscape Architecture.*

*John King, B.A., MUS.B., M.A. (Cambridge University), PH.D. (University of Toronto), *F.A.G.O., Professor of Music.*

Robert Lyle King, B.S. (Lycoming College), M.S.ED. (Bucknell University), *Instructor in Education.*

Himy Benjamin Kirshen, B.S. (Whitman College), M.A. (Columbia University), PH.D. (University of Wisconsin), *Dean of School of Business Administration.*

Erik K. M. Kjeldsen, B.S., M.S. (Springfield College), *Instructor in Physical Education.*

Robert William Kleis, B.S., M.S., PH.D. (Michigan State University), *Professor of Agricultural Engineering and Head of Department.*

Edward Karl Knapp, B.S. in ED., M.S. (Cornell University), *Assistant Professor, Research, Cooperative Extension, Home Economics.*

Charles A. Knight, B.S. (Haverford College), M.A. (University of Pennsylvania), *Instructor in English.*

G. Stanley Koehler, A.B., A.M., PH.D. (Princeton University), A.M. (Harvard University), *Professor of English.*

William Gordon Kornegay, B.A., M.ED., PH.D. (University of North Carolina), *Associate Professor of Education.*

Jay Henry Korson, B.S. (Villanova College), M.A., PH.D. (Yale University), *Professor of Sociology and Head of Department.*

Stephen Raymond Kosakowski, *Athletic Coach, Physical Education.*

*Klaus Erlendur Kroner, B.A. (College of Wooster), B.S. in E.E. (New York University), M.S. in B.A. (American International College), *Assistant Professor of Mechanical Engineering.*

Anthony Theodore Krzystofik, B.S. (American International College), M.A. (University of Connecticut), C.P.A. (Commonwealth of Massachusetts), *Assistant Professor of Accounting.*

Essayas George Kundert, Dr. Math. Technische Hochschule (Zurich, Switzerland), *Professor of Mathematics.*

John William Kuzmeski, B.S. (University of Massachusetts), *Professor, Research, in charge of Feed, Fertilizer, and Dairy Law.*

Rudolph Harold Kyler, J.SC.D. (University of Breslau), *Associate Professor of Finance.*

Eleanor Ann LaBelle, B.A. (University of Massachusetts), M.A. (Mount Holyoke College), *Instructor in Speech.*

William Henry Lachman, Jr., B.S., M.S. (Pennsylvania State University), *Professor, Research, Horticulture.*

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*On leave 1964–65

John Eric Laestadius, B.E.E., M.S. (Polytechnic Institute of Brooklyn), *Associate Professor of Electrical Engineering.*

Joseph Walton Langford, Jr., B.S. in E.E. (University of New Hampshire), S.M. in E.E. (Massachusetts Institute of Technology), *Professor of Electrical Engineering.*

Joseph Langland, B.A., M.A. (State University of Iowa), *Professor of English.*

Orville Kurth Larson, B.S. (University of Wisconsin), M.A. (Western Reserve University), PH.D. (University of Illinois), *Associate Professor of Speech.*

Lorraine Doris Lavallee, B.A. (Mount Holyoke College), M.A. (University of Massachusetts), PH.D. (University of Michigan), *Assistant Professor of Mathematics.*

Henry Arthur Lea, B.S. in ED., M.A., PH.D. (University of Pennsylvania), *Assistant Professor of German.*

John Allen Leaman, Jr., B.S., M.ED. (Boston University), *Instructor in Physical Education and Assistant Athletic Coach.*

Deane Lee, B.S., M.S. (University of Massachusetts), *Assistant Professor of Agricultural and Food Economics.*

Walter Wilfred Lee, M.B., M.D. (University of Toronto), M.P.H. (Harvard University), *Lecturer in Public Health.*

Theodore William Leed, B.S., M.S., PH.D. (Ohio State University), *Extension Professor of Agricultural and Food Economics.*

Robert Ward Lentilhon, B.S. (University of Rhode Island), M.B.A. (Boston University), C.P.A. (Commonwealth of Massachusetts), *Associate Professor of Accounting.*

David Phelps Leonard, B.A. (Brown University), M.A., PH.D. (University of Michigan), *Assistant Professor of History.*

Simon Lesser, PH.B. (University of Chicago), *Visiting Lecturer in English.*

Arthur Sidney Levine, B.S., M.S., PH.D. (University of Massachusetts), *Professor of Food Technology.*

*David William Lewit, A.B. (Princeton University), M.A. (Stanford University), PH.D. (University of Minnesota), *Assistant Professor in Psychology.*

James Edward L'Heureaux, B.S., M.S. (Louisiana State University), *Instructor in Mathematics.*

Robert Gordon Light, B.S. (University of Maine), M.S. (Pennsylvania State University), *Assistant Professor, Research, Agricultural Engineering.*

John Henry Lilly, B.S., PH.D. (University of Wisconsin), *Professor of Entomology and Plant Pathology and Head of Department.*

Clifford Peter Lillya, A.B. (Kalamazoo College), PH.D. (Harvard University), *Staff Associate in Chemistry.*

Waldo Chandler Lincoln, Jr., B.S. (University of Massachusetts), *Instructor, Research, Seed Control.*

Edgar Ernest Lindsey, B.S. in CH.E. (Georgia Institute of Technology), D.ENG. (Yale University), *Acting Dean, School of Engineering.*

Warren Litsky, A.B. (Clark University), M.S. (University of Massachusetts), PH.D. (Michigan State University), *Commonwealth Professor, Research, Food Science and Technology.*

Henry Nelson Little, B.S. (Cornell University), M.S., PH.D. (University of Wisconsin), *Professor of Chemistry.*

Robert Blair Livingston, A.B. (Colorado College), M.A., PH.D. (Duke University), *Professor of Botany, and Acting Head, Department of Botany.*

Charles Randell Lockard, B.S. (New York State College of Forestry), M.F. (Harvard University), *Associate Professor, Research, Forestry and Wildlife Management.*

Mrs. Mary Eugene Lojkin, B.S., M.S. (Polytechnic Institute, Petrograd), PH.D. (Columbia University), *Assistant Professor, Research, Home Economics Nutrition.*

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*On leave 1964–65

*Joseph Lopreato, B.A. (University of Connecticut), M.A., PH.D. (Yale University), *Assistant Professor of Sociology and Anthropology.*

William John Lord, B.S., M.S. (University of New Hampshire), PH.D. (Pennsylvania State University), *Assistant Extension Professor of Horticulture.*

Earl Eastman Lorden, B.S., M.ED. (University of New Hampshire), *Assistant Director of Athletics.*

Bernard Wentzel Lovell, B.S., M.S., E.E. (Massachusetts Institute of Technology), *Assistant Professor of Electrical Engineering.*

James Buren Ludtke, B.A., M.A., PH.D. (State University of Iowa), *Professor of Business Finance and Chairman of Department of General Business and Finance.*

Robert Francis Lukowski, B.S., A.B., M.B.A. (University of Denver), *Assistant Professor of Food Science and Technology.*

Donald E. Lundberg, B.A. (Iowa State Teachers College), M.A. (Duke University), PH.D. (Cornell University), *Professor of Food Science and Technology.*

Sidney John Lyford, Jr., B.S. (University of New Hampshire), M.S. (North Carolina State University), *Assistant Professor, Research, Dairy and Animal Science.*

John Albert MacCombie, B.A. (Yale University), *Instructor in Romance Languages.*

William Preston MacConnell, B.S. (University of Massachusetts), M.F. (Yale University), *Professor of Forestry and Wildlife Management.*

Mary Elizabeth Macdonald, A.B. (Emmanuel College), M.A. (Columbia University), *Professor of Nursing Education.*

Arthur Elwood Mack, B.S. (Springfield College), *Instructor in Physical Education.*

Donald Lewis Mader, B.S. (New York State College of Forestry), M.S., PH.D. (University of Wisconsin), *Associate Professor, Research, Forestry and Wildlife Management.*

Mary Ann Maher, B.S., A.M. (Columbia University), *Dean of the School of Nursing.*

Mary E. Mahnken, B.A. (Geneva College), M.F.A. (Carnegie Institute of Technology), *Assistant Professor of Speech.*

Lewis Casper Mainzer, B.A. (New York University), M.A., PH.D. (University of Chicago), *Assistant Professor of Government.*

John Francis Manfredi, B.S. (University of Pennsylvania), M.A., PH.D. (Harvard University), *Assistant Professor of Sociology and Anthropology.*

Paul Alexander Mankin, A.A., B.A., M.A. (University of California at Los Angeles), PH.D. (Yale University), *Associate Professor of Romance Languages.*

Myron B. Manley, B.S. (University of Utah), *Instructor in Psychology.*

Julie N. Mannarino, B.S. (Central Connecticut State College), M.S. (Purdue University), *Instructor in Mathematics.*

Joseph Sol Marcus, B.S. (Worcester Polytechnic Institute), M.S. (University of Massachusetts), *Professor of Civil Engineering.*

Donald Raymond Marion, B.S., M.S. (Cornell University), *Assistant Professor, Research, Agricultural and Food Economics.*

Richard Slater Martin, A.B. (Harvard University), M.S. (Cornell University), *Assistant Professor of Economics.*

Yoshihiro Maruyama, B.S., M.S., PH.D. (Hokkaido University, Japan), *Visiting Assistant Professor, Research, Agricultural and Food Economics.*

George Anthony Mastroianni, B.A. (Pennyslvania State University), M.S. (Syracuse University), *Instructor in Education.*

Helen Constance Mather, B.S., M.S. (Boston College), *Instructor in Medical and Surgical Nursing.*

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*On leave 1964–65

Donald Roy Matheson, b.s. (United States Military Academy), a.m. (University of Michigan), *Associate Professor of Art.*

Alfred Herman Mathieson, Jr., s.b. (State Teachers College, East Stroudsburg, Pennsylvania), m.a. (Columbia University), *Assistant Professor of Physics.*

*Joseph Corwin Mawson, b.s. (University of Maine), m.f. (Duke University), *Instructor in Forestry and Wildlife Management.*

David Mayhew, b.a. (Amherst College), *Instructor in Government.*

Donald Nelson Maynard, b.s. (University of Connecticut), m.s. (North Carolina State College), ph.d. (University of Massachusetts), *Assistant Professor, Research, Horticulture.*

Harold Timothy McCarthy, b.a. (University of Massachusetts), m.a., ph.d. (Harvard University), *Associate Professor of English.*

Peggy Ann McConnell, b.s., m.s. (University of Minnesota), *Instructor, Research, Dairy and Animal Science.*

Mrs. Jane Frances McCullough, b.s., m.s. (Ohio University), *Assistant Professor of Home Economics.*

Charles Osborne McDonald, b.a., m.a. (Wesleyan University), ph.d. (Yale University), *Assistant Professor of English.*

William E. McEwen, b.a., m.a., ph.d. (Columbia University), *Commonwealth Head of Department of Chemistry.*

George Emmert McGill, b.a. (Carleton College), m.s. (University of Minnesota), ph.d. (Princeton University), *Assistant Professor of Geology.*

William Anthony McGinnis, b.a. (Providence College), Captain, USA, *Assistant Professor of Military Science.*

Warren Pierce McGuirk, ph.b. (Boston College), ed.m. (Boston University), *Dean of the School of Physical Education.*

Ronald Albert McHaffey, b.sc. (Brooklyn Polytechnic Institute), m.sc. (Iowa State College), ph.d. (Rutgers University), *Assistant Professor of Mathematics.*

Malcolm Arthur McKenzie, ph.b., a.m., ph.d. (Brown University), *Director, Shade Tree Laboratories.*

Mary Elizabeth McManamy, b.sc. (Fitchburg State Teachers College), m.sc. (University of Massachusetts), *Assistant Professor of Education.*

John James McRitchie, b.a. (DePauw University), m.s., ph.d. (Ohio State University), *Assistant Professor, Research, Entomology and Plant Pathology.*

*Earl James McWhorter, b.s. (Rensselaer Polytechnic Institute), ph.d. (Cornell University), *Assistant Professor of Chemistry.*

William James Mellen, b.s. (University of Massachusetts), m.s., ph.d. (Cornell University), *Professor, Research, Poultry Science.*

*Marjorie Mary Merchant, b.s. (University of Maine), m.s. (Pennsylvania State University), *Associate Extension Professor of Home Economics.*

William Warner Metcalfe, b.s. (University of New Hampshire), m.s. (University of Massachusetts), *Assistant Extension Professor, 4-H.*

Louis Franklin Michelson, b.s., m.s., ph.d. (University of Massachusetts), *Assistant Professor of Agronomy.*

Mrs. Eleanor Hull Miller, b.a. (Mt. Holyoke College), m.a. (Middlebury College), *Instructor in Romance Languages.*

Melton M. Miller, Jr., b.s. in c.e. (University of Vermont), m.s. in c.e. (Purdue University), *Assistant Professor of Civil Engineering.*

Reuben George Miller, b.a. (LaSalle College), m.a. (Montana State University), *Instructor in Economics.*

*John Howard Mitchell, b.s. (Bowdoin College), a.m. (Harvard University), *Associate Professor of English.*

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*On leave 1964–65

John William Mohn, m.e. (Stevens Institute of Technology), b.s. (Worcester Polytechnic Institute), m.s. (Stanford University), *Associate Professor of Electrical Engineering.*

John George Moner, a.b. (Johns Hopkins University), m.a., ph.d. (Princeton University), *Assistant Professor of Physiology.*

Edward Carter Moore, a.b. (Western Michigan University), m.a. in educational administration, m.a. in philosophy, ph.d. (University of Michigan), *Dean of the Graduate School and Coordinator of Research.*

John William Moore, a.b. (Lawrence College), ph.d. (Indiana University), *Assistant Professor of Psychology.*

Gabriela Cruz Mora, Bachiller en Letras, Professora de Castellano (University of Chile), *Instructor in Romance Languages.*

Ernest Wilfred Morin, b.a. (University of Montreal), d.v.m. (St. Hyacinthe Veterinary College), m.v.sc. (Ontario Veterinary College), *Instructor, Research, Veterinary Science.*

Bruce Robert Morris, a.b. (Western Reserve University), m.a. (Ohio State University), ph.d. (University of Illinois), *Professor of Economics and Acting Head, Department of Economics.*

Earl Miller Mortensen, b.a., ph.d. (University of Utah), *Assistant Professor of Chemistry.*

Robert Paul Mortlock, b.s. (Rensselaer Polytechnic Institute), ph.d. (University of Illinois), *Assistant Professor of Microbiology.*

Edwin Moser, a.b., a.m., ph.d. (New York University), *Instructor in English.*

Harold Elwood Mosher, b.s., b.l.a., m.l.a. (University of Massachusetts), *Associate Extension Professor of Landscape Architecture.*

Gilbert Edward Mottla, a.b. (Harvard University), *Head, Department of Agricultural Communications.*

Ward Sundt Motts, b.a. (Columbia University), m.s. (University of Minnesota), ph.d. (University of Illinois), *Associate Professor of Geology.*

William Samuel Mueller, b.s. (University of Illinois), m.s. (Rutgers University), ph.d. (University of Massachusetts), *Associate Professor, Research, Dairy and Animal Science.*

*Arthur Benson Musgrave, b.s., m.s. (Boston University), ph.d. (University of Minnesota), *Nieman Fellow in Journalism* (Harvard University), *Professor of Journalism and English.*

Jerome L. Myers, b.a. (Syracuse University), m.a., ph.d. (University of Wisconsin), *Associate Professor of Psychology.*

Wassef Wahba Nawar, b.s., m.s. (University of Cairo, Egypt), ph.d. (University of Illinois), *Associate Professor, Research, Food Science and Technology.*

Clair Wayland Naylor, m.a., ph.b. (Yale University), *Instructor in Mathematics.*

Claude Cassell Neet, a.b. (University of California), m.a., ph.d. (Clark University), *Professor of Psychology and Head of Department.*

Albert Bigelow Nelson, b.s. (Colby College), m.s. (Middlebury College), *Assistant Professor of Geology.*

Addreen Nichols, b.s., m.s. (Oregon State College), ph.d. (Michigan State University), *Associate Professor of Home Economics.*

Arthur Ellsworth Niedeck, b.s. (Ithaca College), m.a. (Cornell University), *Professor of Speech and Head of Department.*

Marion A. Niederpruem, b.s. (New York State College at Buffalo), m.a. (New York University), ph.d. (University of Michigan), *Dean of the School of Home Economics and Professor of Home Economics.*

Henry Zygmunt Niedzielski, baccalaureat (Tyros, France), certificat d'etudes litteraires generales (University of Dijon, France), b.a. (University of Connecticut), *Instructor in Romance Languages.*

Bruce Raymond Nilsson, b.b.a. (University of Massachusetts), Captain, USA, *Assistant Professor of Military Science.*

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*On leave 1964–65

John Stanley Norton, b.s. (Pennsylvania State University), m.s. (Louisiana State University), *Associate Professor, Research, Agricultural Engineering.*

Paul Foote Norton, b.a. (Oberlin College), m.f.a., ph.d. (Princeton University), *Professor of Art and Head of Department.*

Robert Joseph Novak, b.s. in ch.e. (Washington University, St. Louis), *Assistant Professor of Chemical Engineering.*

Torsten Norvig, b.a. (University of Copenhagen), m.a. (Brown University), *Assistant Professor of Mathematics.*

John Henry Noyes, b.s. (University of Connecticut), m.f. (Yale University), *Extension Professor of Forestry and Wildlife Management.*

William Brown Nutting, b.s., m.s. (University of Massachusetts), ph.d. (Cornell University), *Associate Professor of Zoology.*

Gail Barker Oakland, b.a. (University of Saskatechewan), m.a. (University of Minnesota), ph.d. (University of Aberdeen), *Professor of Statistics.*

George James Oberlander, b.s. (Tufts University), m.s. (University of Massachusetts), *Assistant Professor of Chemistry.*

Joseph Michael O'Byrne, b.s. in m.e. (University of Cincinnati), m.s. in m.e. (University of Kentucky), *Associate Professor of Mechanical Engineering.*

Walter Gregory O'Donnell, a.b., m.a. (Western Reserve University), ll.b. (John Marshall Law School), ph.d. (Columbia University), *Professor of Management.*

William Gregory O'Donnell, b.s. (University of Massachusetts), m.a., ph.d. (Yale University), *Professor of English.*

Sally Ann Ogilvie, b.s., m.ed. (University of North Carolina), *Associate Professor of Physical Education.*

William Griffin O'Hare, Jr., b.a. (University of Notre Dame), m.a. (Boston University), *Director, Bureau of Government Research.*

Helen Frances O'Leary, b.s. in ed., ed.m. (Boston University), ph.d. (University of Connecticut), *Associate Professor of Education.*

Olga Marion Olesiuk, b.a. (Mount Holyoke College), m.s. (University of Massachusetts), *Assistant Professor, Research, Veterinary Science.*

Charles Frank Oliver, b.s., m.s. (University of Massachusetts), ph.d. (University of Connecticut), *Professor of Education.*

John Walter Olver, b.s. (Rensselaer Polytechnic Institute), m.s. (Tufts University), ph.d. (Massachusetts Institute of Technology), *Assistant Professor of Chemistry.*

Felix E. Oppenheim, doctor of law (University of Brussels), ph.d. (Princeton University), *Professor of Government.*

John Francis O'Rourke, b.a. (University of Massachusetts), ph.d. (Yale University), *Assistant Professor of Sociology and Anthropology.*

John Michael Orr, b.a. (Beloit College), *Head Basketball Coach.*

*Elmer Clayton Osgood, c.e., d.eng. (Rensselaer Polytechnic Institute), *Professor of Civil Engineering.*

Raymond Herman Otto, b.s. (University of Massachusetts), m.l.a. (Harvard University), *Professor of Landscape Architecture and Head of Department.*

Alex Page, b.a. (University of Vermont), m.a., ph.d. (Harvard University), *Associate Professor of English.*

Peter Park, b.a. (Columbia University), m.a., ph.d. (Yale University), *Assistant Professor of Sociology.*

Richard Graham Parker, b.s. (University of Massachusetts), Captain, USA, *Assistant Professor of Military Science.*

Mrs. Gertrude Parkinson, b.s., m.s. (University of Massachusetts), *Instructor in Chemistry.*

*Clarence Howard Parsons, b.s., m.s. (University of Massachusetts), *Extension Professor of Dairy and Animal Science, Nyasaland Contract.*

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*On leave 1964–65

Surendra Nath Patnaik, b.s. (Ravenshaw College, India), m.s. (Banaras Hindu University), ph.d. (University of Illinois), *Assistant Professor of Mathematics.*

Raymond Alexander Patten, b.s. (Massachusetts Institute of Technology), ph.d. (Duke University), *Assistant Professor of Physics.*

Robert Kincaid Patterson, b.s. (University of Maine), *Associate Professor of Mechanical Engineering.*

Henry Brown Peirce, Jr., b.a. (University of Massachusetts), m.a. (University of Michigan), *Assistant Professor of Speech.*

Lyle N. Perkins, b.f.a., m.f.a. (Alfred University), ph.d. (Ohio State University), *Associate Professor of Art.*

Robert Charles Perriello, b.s. (University of Massachusetts), *Associate Professor of Public Health.*

Emil Forrest Perry, b.a. (University of New Hampshire), *Major, Assistant Professor of Air Science.*

Ralph Reinhard Pippert, b.s. (Mission House College), m.s., ph.d. (University of Wisconsin), *Associate Professor of Education.*

Edward Stanley Pira, b.s. (University of Connecticut), m.s. (University of Massachusetts), *Assistant Professor of Agricultural Engineering.*

Ann Pope, b.a. (University of London), m.a. (Cornell University), *Instructor in German-Russian.*

David Thomas Porter, b.a. (Hamilton College), *Instructor in English.*

Lee Dickerman Post, a.b. (Mount Holyoke College), m.ed. (Springfield College), *Instructor in Romance Languages.*

Robert Aaron Potash, a.b., a.m., ph.d. (Harvard University), *Professor of History.*

Frank Elwood Potter, b.s. (University of Maine), m.s. (University of Maryland), ph.d. (Pennsylvania State University), *Associate Professor of Dairy and Animal Science.*

Richard Howard Powers, b.a., m.a., ph.d. (Ohio State University), *Associate Professor of History.*

Louis Elliot Price, a.b. (University of California), m.a., ph.d. (State University of Iowa), *Assistant Professor of Psychology.*

William Kirby Price, b.s. (University of Maryland), m.s. (University of Wisconsin), *Instructor in Speech.*

Paul Nicholas Procopio, b.s., m.s. (University of Massachusetts), *Professor of Landscape Architecture.*

Nicholas Prodany, b.s. (Tufts University), *Instructor in Chemical Engineering.*

Albert William Purvis, a.b. (University of New Brunswick), m.ed., d.ed. (Harvard University), *Dean of the School of Education.*

*Eugene Charles Putala, b.s., m.s. (University of Massachusetts), *Assistant Professor of Botany.*

Howard H. Quint, b.a. (Yale University), m.a. (Stanford University), ph.d. (Johns Hopkins University), *Professor of History and Head of Department.*

Lili Elizabeth Rabel, a.b., m.a. (University of Michigan), ph.d. (University of California, Berkeley), *Assistant Professor of English.*

William Edwin Randall, Jr., b.s. (University of Massachusetts), m.s., ph.d. (University of Wisconsin), *Professor of Recreation Leadership and Head of Department.*

Mrs. Gabriella Ratay, b.s. (University of Massachusetts), *Instructor in Mathematics.*

*Marc Leonard Ratner, b.s. (Fordham University), m.a. (University of Pennsylvania), ph.d. (New York University), *Assistant Professor of English.*

Harold Rauch, b.s. (Queens College), m.s. (University of Illinois), ph.d. (Brown University), *Professor of Zoology.*

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*On leave 1964–65

Marvin Dean Rausch, b.s., ph.d. (University of Kansas), *Associate Professor of Chemistry.*

Agnes Gross Raymond, a.b. (Wilson College), m.a. (Syracuse University), d.m.l. (Middlebury College), *Assistant Professor of Romance Languages.*

Georgia Reid, b.s. (State University of New York at Cortland), m.a. (Mills College), *Assistant Professor of Physical Education.*

Mrs. Edith Reinisch, (Charles University Medical School, Prague), m.s. (University of Wisconsin), *Instructor in Public Health.*

Iona Mae Reynolds, b.s., m.s. (University of Massachusetts), *Instructor, Research, Veterinary Science.*

Lawrence Duncan Rhoades, b.s. (University of Massachusetts), *Associate Extension Professor of Agricultural and Food Economics.*

Arnold Densmore Rhodes, b.s. (University of New Hampshire), m.f. (Yale University), *Professor of Forestry and Wildlife Management and Head of Department.*

Benjamin Ricci, Jr., b.s., m.ed., d.p.e. (Springfield College), *Associate Professor of Physical Education.*

Mrs. Louise Eleanor Rice, a.b., a.m. (University of Massachusetts), *Instructor in Mathematics.*

Thomas Edwin Rice, b.s. (University of Massachusetts), *Instructor in Geology.*

William Newell Rice, b.s. (Sioux Falls College), m.s., ph.d. (Iowa State College), *Associate Professor of Entomology and Plant Pathology.*

George Robert Richason, Jr., b.s., m.s. (University of Massachusetts), *Associate Professor of Chemistry.*

Maida Leonard Riggs, b.s. (University of Massachusetts), m.a. (University of California), *Associate Professor of Physical Education.*

Edward James Rising, b.m.e. (Rensselaer Polytechnic Institute), m.m.e. (Syracuse University), ph.d. (State University of Iowa), *Associate Professor of Mechanical Engineering.*

Robert Louis Rivers, a.b. (Clark University), m.s., ph.d. (University of Illinois), *Associate Professor of Finance and Transportation.*

John Edwin Roberts, b.s., m.s. (University of New Hampshire), ph.d. (Cornell University), *Professor of Chemistry.*

*John Lewis Roberts, b.s., m.s. (University of Wisconsin), ph.d. (University of California), *Associate Professor of Zoology.*

Kenneth DeWitt Roberts, b.s. (Massachusetts Institute of Technology), m.e. (Yale University), *Assistant Professor of Mechanical Engineering.*

Larry Spurgeon Roberts, b.s. (Southern Methodist University), m.s. (University of Illinois), sc.d. (Johns Hopkins University), *Assistant Professor of Zoology.*

Peter Robinson, a.b. (Dartmouth College), m.sc. (University of Otago, New Zealand), ph.d. (Harvard University), *Assistant Professor of Geology.*

Trevor Robinson, a.b. (Harvard College), a.m. (Harvard University), m.s. (University of Massachusetts), ph.d. (Cornell University), *Associate Professor of Chemistry.*

Leland H. S. Roblee, Jr., b.s. in ch.e., m.s. in ch.e., ph.d. in m.e. (Purdue University), *Assistant Professor of Chemical Engineering.*

*Shirley Grey Roby, b.a. (Longwood College), m.a. (Woman's College, University of North Carolina), *Instructor in Physical Education.*

Joseph Richard Rogers, Jr., *Associate Professor of Physical Education.*

Richard Allen Rohde, a.b. (Drew University), m.s., ph.d. (University of Maryland), *Associate Professor, Research, Entomology and Plant Pathology.*

Herbert Duncan Rollason, Jr., a.b. (Middlebury College), m.a. (Williams College), a.m., ph.d. (Harvard University), *Associate Professor of Zoology.*

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*On leave 1964–65

ROBERT ALLEN ROSEMIER, B.S., M.S. (State University of New York, College of Education), PH.D. (State University of Iowa), *Assistant Professor of Education.*

PHILIP ROSEN, B.CH.E. (City College of New York), M.S., PH.D. (Yale University), *Professor of Physics, and Acting Head, Department of Physics.*

WILLIAM ALLISON ROSENAU, B.S. (Yale University), M.S. (University of Connecticut), PH.D. (Pennsylvania State University), *Assistant Professor of Horticulture.*

WILLIAM HAROLD ROSS, B.A., M.A. (Amherst College), PH.D. (Yale University), *Professor of Physics.*

IRVING PAUL ROTHBERG, B.S. (Temple University), M.A., PH.D. (Pennsylvania State University), *Associate Professor of Romance Languages.*

ROBERT LEE ROWELL, B.S. in ED. (Bridgewater State Teachers College), M.S. (Boston College), PH.D. (Indiana University), *Assistant Professor of Chemistry.*

JOHN RAYMOND ROWLEY, A.B. (University of California), M.A. (University of Oregon), PH.D. (University of Minnesota), *Assistant Professor of Botany.*

CARL SHERWOOD ROYS, B.S. (Worcester Polytechnic Institute), M.S. in E.E., PH.D. (Purdue University), *Professor of Electrical Engineering.*

SEYMOUR RUDIN, B.A., M.S. (City College of New York), PH.D. (Cornell University), *Assistant Professor of English.*

*NANCY CAROLYN RUPP, B.S. (Sargent College, Boston University), M.S. (State University of Iowa), *Assistant Professor of Physical Education.*

SARGENT RUSSELL, B.S. (University of Maine), M.S. (Cornell University), PH.D. (University of Massachusetts), *Associate Professor of Agricultural and Food Economics.*

DAVID JOHN RUSSO, B.A. (University of Massachusetts), M.A. (Yale University), *Instructor in History.*

ELIZABETH MARY RUST, B.S., M.S., PH.D. (Kansas State University), *Associate Professor, Research, Home Economics.*

SAM WARREN SACRA, B.S. (University of Maryland), Lieutenant Colonel, USA, *Assistant Professor of Military Science.*

THEODORE DAVID SARGENT, B.S. (University of Massachusetts), M.S., PH.D. (University of Wisconsin), *Instructor in Zoology.*

EDWARD SARNO, B.S. (Boston University), M.A. (Michigan State University), *Instructor in Speech.*

KANDULA SITA RAMA SASTRY, B.S., M.S. (Andhra University, India), PH.D. (Indiana University), *Assistant Professor of Physics.*

JAY SAVEREID, B.S., M.A. (Northwestern University), *Assistant Professor of Speech.*

F. MILES SAWYER, S.B. (Massachusetts Institute of Technology), M.S., PH.D. (University of California), *Associate Professor, Research, Food Science and Technology.*

ABUL MAKSUD SAYIED, B.SC., M.SC., PH.D. (University of Calcutta), *Assistant Professor of Mathematics.*

JORG SCHAFER (University Tubingen), *Instructor in German.*

ANDREW J. W. SCHEFFEY, B.A. (Haverford College), M.S., PH.D. (University of Michigan), *Associate Extension Professor, Forestry and Wildlife Management.*

EVA SCHIFFER, B.S. (University of Massachusetts), A.M., PH.D. (Radcliffe College), *Assistant Professor of German.*

THEODORE ALFRED SCHMITT, B.S., M.ED. (University of Pittsburgh), *Associate Professor of Physical Education and Assistant Football Coach.*

SIDNEY SCHOEFFLER, B.S. (New York University), A.M. (University of Pennsylvania), PH.D. (The New School for Social Research), C.P.A. (New Jersey), *Professor of Economics.*

JOHN F. W. SCHULZE, B.S., M.S. (University of Massachusetts), *Rural Civil Defense Extension Specialist.*

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*On leave 1964–65

Harry Schumer, b.sc., m.a., ph.d. (Ohio State University), *Assistant Professor of Psychology.*

*Rudolf Mathias Schuster, b.sc., m.sc. (Cornell University), ph.d. (University of Minnesota), *Professor of Botany.*

Elliott Shelling Schwartz, b.a. (Columbia University), m.a., d.ed. (Teachers College, Columbia University), *Instructor in Music.*

Ronald Schwartz, b.a. (Brooklyn College), m.a. (University of Connecticut), *Instructor in Romance Languages.*

Donald Edward Scott, b.s. in e.e., m.s. in e.e. (University of Connecticut), *Assistant Professor of Electrical Engineering.*

Robert Seibel, b.a. (Syracuse University), m.a., ph.d. (State University of Iowa), *Associate Research Psychologist, Institute of Environmental Psychophysiology and Visiting Lecturer in Psychology.*

John Joseph Sember, b.s. (Lehigh University), m.a. (University of Oregon), *Instructor in Mathematics.*

Martin Sevoian, b.s. (University of Massachusetts), v.m.d. (University of Pennsylvania), m.s. (Cornell University), *Professor, Research, Veterinary Science.*

Robert Anthony Shanley, a.b., m.a. (Columbia University), ph.d. (Georgetown University), *Assistant Director, Bureau of Government Research.*

Frank Robert Shaw, b.s. (University of Massachusetts), ph.d. (Cornell University), *Professor, Research, Entomology and Plant Pathology.*

G. Dale Sheckels, b.s. in e.e. (University of Washington), m.s. in e.e. (Massachusetts Institute of Technology), ph.d. in e.e. (Iowa State College), *Head of Department of Electrical Engineering.*

Clearence Shute, a.b. (Asbury College), a.m., ph.d. (Columbia University), *Professor of Philosophy and Head of Department.*

Arnold Jacques Silver, a.b. (New York University), m.a., ph.d. (Columbia University), *Associate Professor of English.*

Roy D. Simmons, Jr., b.s. (University of Maryland), m.b.a. (George Washington University), Lt. Colonel, *Assistant Professor of Air Science.*

Frank Albert Singer, b.s., m.b.a., d.b.a. (Indiana University), *Professor of Accounting.*

Philip Joseph Sleeman, b.s. (Fitchburg Teachers College), m.s. (Boston University School of Education), *Instructor in Education.*

Harold William Smart, a.b. (Amherst College), ll.b. (Boston University), *Associate Professor of Business Law.*

Charles Kay Smith, b.a. (University of Iowa), m.a. (Brandeis University), *Instructor in English.*

C. Tyson Smith, b.s., m.s. (Princeton University), *Associate Professor, Research, Feed and Fertilizer.*

Frank Austin Smith, b.a. (University of Massachusetts), m.a. (Northwestern University), *Instructor in Economics.*

Harold Lesley Smith, Jr., b.a. (Swarthmore College), m.a. (Columbia University), ph.d. (University of Wisconsin), Bachelier-es-Lettres (University of Paris), *Assistant Professor of Romance Languages.*

H. T. U. Smith, b.s. (Wooster College), m.a., ph.d. (Harvard University), *Professor of Geology and Head of Department.*

J. Harold Smith, b.s., m.a. (University of Utah), ph.d. (University of Wisconsin), *Professor of Chemistry.*

Marion Estelle Smith, b.s., m.s. (University of Massachusetts), ph.d. (University of Illinois), *Associate Professor of Entomology and Plant Pathology.*

Russell Eaton Smith, b.s. (University of Massachusetts), v.m.d. (University of Pennsylvania), *Professor of Veterinary Science.*

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*On leave 1964–65

Charles Frederick Smyser, Jr., b.s. (University of Maryland), m.s. (University of Connecticut), *Assistant Professor, Research, Veterinary Science.*

John Robert Smyth, Jr., b.s. (University of Maine), m.s., ph.d. (Purdue University), *Professor, Research, Poultry Science.*

James George Snedecor, b.s. (Iowa State College), ph.d. (Indiana University), *Professor of Physiology.*

Glenn Howard Snoeyenbos, d.v.m. (Michigan State University), *Head, Department of Veterinary Science.*

Ernest Augustus Snow, b.s., m.s. (Harvard University), *Lecturer in Public Health.*

Jean Anthony Snow, b.a. (DePauw University), ph.d. (Pennsylvania State University), *Assistant Professor, Research, Plant Pathology.*

Dana Paul Snyder, b.s., m.s. (University of Illinois), ph.d. (University of Michigan), *Assistant Professor of Zoology.*

Daniel Sobala, s.b., s.m. (Massachusetts Institute of Technology), Engineer in Engineering Mechanics (Stanford University), *Associate Professor of Mechanical Engineering.*

Stanley Sobieski, Jr., b.s. (Drexel Institute of Technology), m.s., ph.d. (University of Pennsylvania), *Assistant Professor of Astronomy.*

Edward A. Soltysik, b.s. (Lafayette College, Pennsylvania), m.s., ph.d. (Indiana University), *Associate Professor of Physics.*

Franklin Wallburg Southwick, b.s. (University of Massachusetts), m.s. (Ohio State University), ph.d. (Cornell University), *Head, Department of Horticulture.*

Richard Arthur Southwick, b.s., m.s. (University of Vermont), *Assistant Professor of Agronomy.*

Arless A. Spielman, b.s., ph.d. (University of Minnesota), m.s. (Oregon State College), *Dean of the College of Agriculture, Director of the Experiment Station and Extension Service.*

Herbert George Spindler, b.s. (University of Wisconsin), m.b.s. (Boston University), *Assistant Professor, Research, Agricultural and Food Economics.*

Robert E. Stanfield, b.a. (College of the City of New York), m.a., ph.d. (Harvard University), *Assistant Professor of Sociology.*

*Donald Francis Stanhope, b.a. (Michigan State University), m.a. (University of North Dakota), c.p.a. (North Dakota), *Assistant Professor of Accounting.*

Edmund Joseph Stawiecki, b.s. (University of Massachusetts), m.a. (State University of Iowa), *Instructor in German.*

Ronald Arthur Steele, b.s. (Lebanon Valley College), m.m. (University of Michigan), *Instructor in Music.*

Herbert Frederick Steeper, a.b. (Stanford University), m.a. (Tufts University), m.a. in law and diplomacy (Tufts University), *Lecturer in Government.*

Richard Stephen Stein, b.s. (Brooklyn Polytechnic Institute), m.a., ph.d. (Princeton University), *Commonwealth Professor of Chemistry.*

Thomas Richard Stengle, b.s. (Franklin and Marshall College), m.s. (University of Michigan), *Assistant Professor of Chemistry.*

Douglas Neff Stern, b.s. (Lehigh University), v.m.d. (University of Pennsylvania), *Extension Professor of Veterinary Science.*

Howard Donathan Stidham, b.s. (Trinity College), ph.d. (Massachusetts Institute of Technology), *Assistant Professor of Chemistry.*

Mrs. Doris Skillman Stockton, b.a. (Rutgers University), m.a., ph.d. (Brown University), *Assistant Professor of Mathematics.*

Reynold Lance Stone, b.a. (Marshall College), m.a. (Ohio University), *Instructor in English.*

David Alden Storey, b.s. (University of Massachusetts), m.s., ph.d. (Purdue University), *Associate Professor of Agricultural and Food Economics.*

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*On leave 1964–65

Richard Leonard Stromgren, b.a. (University of Massachusetts), m.a. (Northwestern University), *Instructor in Speech.*

Alice Marie Struzinsky, b.a. (Cortland State Teachers College), m.ed. (Bowling Green State University), *Instructor in Physical Education.*

Charles Raymond Stumbo, b.s., m.s., ph.d. (Kansas State University), *Associate Professor, Research, Food Science and Technology.*

James Edward Sullivan, Jr., b.s. (Merrimack College), m.b.a. (University of Massachusetts), *Instructor in Accounting.*

Mrs. Marjorie Field Sullivan, b.s. (Framingham State Teachers College), m.s. (University of Massachusetts), *Assistant Professor of Home Economics.*

Leila Sussman, b.a. (New York University), m.a. (University of Chicago), ph.d. (Columbia University), *Associate Professor of Sociology and Anthropology.*

Mrs. Claire Mead Swaney, b.a. (Keuka College), m.a. (Middlebury College), *Instructor in Romance Languages.*

Joe William Swanson, b.a., m.a. (Southern Methodist University), m.a., ph.d. (Harvard University), *Associate Professor of Philosophy.*

James Gerard Sweeney, b.a., m.a., ph.d. (Boston University), *Instructor in English.*

Harvey Leroy Sweetman, b.s. (Colorado State College), m.s. (Iowa State College), ph.d. (University of Massachusetts), *Professor of Entomology and Plant Pathology.*

John David Swenson, b.s. (New York University), m.a. (Columbia University), *Professor of Mechanical Engineering.*

*Paul Arthur Swenson, b.s. (Hamline University), ph.d. (Stanford University), *Associate Professor of Physiology.*

Anwar Hussain Syed, b.a., m.a. (University of Panjab, India), m.a. (University of Chicago), m.a., ph.d. (University of Pennsylvania), *Assistant Professor of Government.*

Charles Grandison Taylor, a.b. (University of Maine), ed.m. (Harvard University), *Campus Coordinator, Uganda Project.*

Robert Edward Taylor, b.a. (Reed College), m.a., ph.d. (Columbia University), *Head of Department of Romance Languages, and Professor of French.*

*Warren H. Teichner, b.a., m.s. (University of Oklahoma), ph.d. (State University of Iowa), *Professor of Psychology.*

Vernon R. Tessier, b.a., m.a. (Michigan State University), c.p.a. (Michigan), *Instructor in Finance.*

Ward Theilman, b.s., ph.d. (University of Illinois), *Assistant Professor of Finance.*

Leverne John Thelen, b.s. in ed. (Nebraska State Teachers College), m.a., ed.d. (University of Nebraska), *Assistant Professor of Education.*

Jack M. Thompson, b.a., m.ed., ph.d. (University of South Carolina), *Assistant Professor of History.*

Cecil Lyman Thomson, b.s.a. (University of Toronto), m.s. (University of Minnesota), *Extension Professor of Horticulture.*

Laszlo Martin Tikos, ph.d. (University of Tuebingen, Germany), *Assistant Professor of Russian.*

Elizabeth Ann Tobin, b.a., m.a. (University of Connecticut), *Instructor in Mathematics.*

William Edward Tomlinson, Jr., b.s. (Tufts University), m.s. (University of Massachusetts), *Professor, Research, Entomology and Plant Pathology.*

Ruth Jane Totman, b.s. (Douglass College), m.ed. (University of Pittsburgh), *Professor and Head of Department of Physical Education for Women.*

John Fletcher Townsend, b.s. (Carroll College), m.f.a. (University of Minnesota), *Instructor in Art.*

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*On leave 1964–65

*John Dezendorf Trimmer, a.b. (Elizabethtown College), m.s. (Pennsylvania State University), ph.d. (University of Michigan), sc.d. (Elizabethtown College), *Professor of Physics.*

Joseph Troll, b.s., m.s. (University of Rhode Island), *Assistant Professor of Agronomy.*

Mrs. Mary Dearborn Troxell, b.s. (State University of Iowa), m.s. (New York University, School of Retailing), *Assistant Professor of Home Economics.*

Richard William Trueswell, m.e., m.s. in i.m. (Stevens Institute of Technology), *Associate Professor of Mechanical Engineering.*

Robert Garland Tucker, a.b. (Amherst College), a.m. (Harvard University), ph.d. (Iowa State University), *Assistant Professor of English.*

Charles W. Turner, b.s. (University of Rhode Island), m.s. (North Carolina State College), *Extension Professor, Nyasaland Contract.*

Everett Turner, b.s. (Long Island University), m.a. (University of Massachusetts), *Instructor in Chemistry.*

Alden Parker Tuttle, b.s. (University of Massachusetts), m.s. (Pennsylvania State University), *Assistant Professor of Horticulture.*

Theodore Tzianabos, b.a., m.a. (University of New Hampshire), *Instructor, Research, Veterinary Science.*

Franklyn George Umholtz, a.a. (Long Beach City College), b.a., m.a. (Long Beach State College), *Instructor in Mechanical Engineering.*

Caroline Edith Mary Upton, Teacher's Certificate (Bishop Otter College, England), Supplementary Teacher's Certificate in Physical Education (Chelsea College of Physical Education), *Instructor in Physical Education.*

Ferenc Albert Vali, doctor juris (University of Budapest), ph.d. (University of London), *Professor of Government.*

Henry Van Roekel, m.s. (Virginia Polytechnic Institute), d.v.m. (Iowa State College), ph.d. (Yale University), *Commonwealth Professor, Research, Veterinary Science.*

John R. Van Steenberg, m.a. (Chicago University), ph.d. (Harvard University), *Assistant Professor of History.*

Henry Leland Varley, a.b., a.m. (Wesleyan University), ph.d. (University of Wisconsin), *Professor of English.*

Herbert Sidney Vaughan, b.s. (University of Massachusetts), m.p.a. (Harvard University), *Head, Extension Division of Agriculture.*

Christine Lynn Vendien, b.s. (Eastern Michigan University), m.a. (University of Michigan), ed.d. (Stanford University), *Assistant Professor of Physical Education.*

Jonas Vengris, m.agr. (Agricultural College, Dotnuva, Lithuania), d.agr.sc. (University of Bonn), *Associate Professor, Research, Agronomy.*

Donald Van Pelt Waddington, b.s. (Pennsylvania State University), m.s. (Rutgers University), *Instructor in Agronomy.*

Mahlon Whitney Wagner, b.sc. (Bucknell University), ph.d. (University of Rochester), *Instructor in Psychology.*

Robert Wanner Wagner, a.b. (Ohio University), m.a., ph.d. (University of Michigan), *Associate Dean, College of Arts and Sciences.*

Edith G. Walker, b.s. (University of Pennsylvania), m.a. (Teachers College, Columbia University), *Assistant Professor of Maternal and Child Nursing.*

Esther Marie Wallace, b.s. (Boston University), m.s. (Wellesley College), *Associate Professor of Physical Education.*

Bruce Curtis Warner, b.a. (Roberts Wesleyan College), m.a. (University of Rochester), *Assistant Professor of Education.*

Herbert Edwin Wave, b.s. (University of Maine), m.s., ph.d. (Rutgers University), *Assistant Professor, Research, Entomology and Plant Pathology.*

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*On leave 1964–65

WILLIAM HENRY WEAVER, B.S. in I.E., M.S. in I.E., I.E. (Pennsylvania State University), *Professor of Mechanical Engineering and Head of Department.*

GREGORY WORTHINGTON WEBB, B.A., M.A., PH.D. (Columbia University), *Associate Professor of Geology.*

MARTIN EDWARD WEEKS, B.S. (South Dakota State College), PH.D. (University of Wisconsin), *Extension Professor of Agronomy.*

WALTER DRURY WEEKS, B.S., M.S. (University of New Hampshire), PH.D. (University of Massachusetts), *Associate Professor, Research, Horticulture.*

GEORGE PHILIP WEIDMANN, B.S. (College of the City of New York), M.A. (Columbia University), *Associate Professor of Mechanical Engineering.*

ROBERT ROY WELLMAN, A.B. (Dartmouth College), P.G.C.E. (University of London, Institute of Education), M.A. (Western Reserve University), PH.D. (Ohio State University), *Assistant Professor of Education.*

TERRY HUTCHINSON WELLS, B.S. (University of Wisconsin), M.S. (University of Illinois), *Instructor in Speech.*

CARL RICHARD WENDOLOSKI, B.A. (Amherst College), *Instructor in Economics.*

JOHN CHARLES WESTON, JR., B.A. (University of California), M.A. (University of Chicago), PH.D. (University of North Carolina), *Associate Professor of English.*

*SIDNEY FREDERICK WEXLER, B.S., PH.D. (New York University), M.A. (University of Colorado), *Associate Professor of Romance Languages.*

ELLSWORTH HAINES WHEELER, B.S. (University of Massachusetts), M.S., PH.D. (Cornell University), *Professor of Entomology and Plant Pathology.*

WARREN DRAPER WHITCOMB, B.S. (University of Massachusetts), *Professor, Research, Entomology and Plant Pathology.*

MRS. BARBARA JEANNE WHITE, A.B., M.A. (Mount Holyoke College), *Instructor in Zoology.*

MERIT PENNIMAN WHITE, A.B., C.E. (Dartmouth College), M.S., PH.D. (California Institute of Technology), *Commonwealth Head of Department of Civil Engineering.*

EARLE DIXON WHITNEY, B.S. (University of Massachusetts), *Instructor, Research, Landscape Architecture.*

LESTER FRANK WHITNEY, B.S. (University of Maine), M.S. (Michigan State University), *Assistant Professor of Agricultural Engineering.*

KENNETH P. WICKMAN, B.A. (University of Massachusetts), M.A. (University of Michigan), PH.D. (Syracuse University), *Assistant Professor of Economics.*

FRANKLIN BACON WICKWIRE, B.A. (Hanover College), M.A. (Indiana University), PH.D. (Yale University), *Assistant Professor of History.*

MARION FRANCES WIENERS, R.N. (St. Elizabeth's Hospital School of Nursing), B.S.N. (Boston College School of Nursing), M.S. (Boston University School of Nursing), *Instructor in Nursing.*

ROBERT THAYER WILCE, B.S. (University of Scranton), M.S. (University of Vermont), PH.D. (University of Michigan), *Assistant Professor of Botany.*

THOMAS OBERSON WILKINSON, A.B. (University of North Carolina), M.A. (Duke University), PH.D. (Columbia University), *Associate Professor of Sociology and Anthropology.*

ARTHUR ROBERT WILLIAMS, A.B. (Clark University), A.M., PH.D. (Cornell University), *Associate Professor of English.*

RICHARD J. WILLIAMS, B.S., M.A. (Loyola University), *Instructor in English.*

ROBERT MAXWELL WILLIAMS, B.S. (Dartmouth College), M.S. (University of New Hampshire), PH.D. (Iowa State College), *Assistant Professor of Chemistry.*

SCHAFER WILLIAMS, A.B., M.A. (Harvard University), STB (Harvard Divinity School), PH.D. (University of California), *Associate Professor of History.*

MERLE GILBERT WILLMANN, B.S. (University of Illinois), *Instructor in Recreation.*

KAROL STANLEY WISNIESKI, B.S. (University of Massachusetts), M.P.H. (University of Michigan), *Assistant Professor of Public Health.*

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*On leave 1964–65

Horst Wittmann, m.a. (University of Goettingen, Germany), *Instructor in German-Russian.*

Melvin Herbert Wolf, b.a. (University of Massachusetts), m.a., ph.d. (University of Michigan), *Instructor in English.*

Harriet Joan Wright, b.s. (Framingham State Teachers College), m.s. (University of Illinois), *Associate Extension Professor of Home Economics.*

Mrs. Martha Rockhold Wright, b.s. (Miami University), *Instructor in English.*

Albert Wrisley, Jr., b.s. (Cornell University), m.a. (Michigan State University), *Assistant Professor of Food Technology.*

Raymond Wyman, b.s. (University of Massachusetts), m.ed., ed.d. (Boston University), *Professor of Education, and Director, Audiovisual Center.*

Alfred Martin Wynne, b.s., m.s. (University of Maine), *Instructor in Chemistry.*

Hrant Missak Yegian, b.s. (Iowa State College), m.s. (University of Massachusetts), *Assistant Professor, Research, Agronomy.*

Robert Ellsworth Young, b.s.a. (Oklahoma Agricultural College), m.s. (Ohio State University), *Professor, Research, Horticulture.*

John Walter Zahradnik, b.s. (Pennsylvania State University), m.s. (Iowa State College), *Associate Professor, Research, Agricultural Engineering.*

Oliver Thomas Zajicek, b.s. (Baldwin-Wallace College), m.s., ph.d. (Wayne State University), *Assistant Professor of Chemistry.*

John Michael Zak, b.s., m.s. (University of Massachusetts), *Assistant Professor of Agronomy.*

Edward Allan Zane, b.b.a. (University of Alaska), m.b.a. (Boston University), *Assistant Professor of Marketing.*

Bert Merton Zuckerman, b.s. (North Carolina State College), m.s. (New York State College of Forestry), ph.d. (University of Illinois), *Professor, Research, Entomology and Plant Pathology.*

Matthew Zunic, b.s. (George Washington University), *Professor of Physical Education.*

VISITING LECTURERS

Ibrahim Abu-Lughod, b.a., m.a. (University of Illinois), m.a., ph.d. (Princeton University), *Visiting Lecturer in Government.*

Helmut I. Brackert, ph.d. (University of Hamburg, Germany), *Visiting Lecturer in German.*

Vincent Brann, b.a. (State University of Iowa), m.a. (Columbia University), *Visiting Lecturer in Educational Radio.*

Mrs. Elizabeth R. Caldwell, b.a. (College of Wooster), *Visiting Lecturer in Education.*

Mrs. Anne H. Chametzky, b.a. (Wellesley College), m.a. (University of Minnesota), *Visiting Lecturer in English.*

David C. Chappelear, b.e. (Yale University), ph.d. (Princeton University), *Visiting Lecturer in Chemical Engineering.*

Jean Cohen, b.a. (University of Michigan), m.a., ph.d. (University of Iowa), *Visiting Lecturer in Psychology.*

Mrs. Blanche Cox, b.a. (Smith College), m.a. ph.d. (University of Chicago), *Visiting Lecturer in Romance Languages.*

Rudolph D. Deanin, b.a. (Cornell University), m.s., ph.d. (University of Illinois), *Visiting Lecturer in Chemistry.*

Esther C. Dunn, b.a. (Cornell University), ph.d. (London), *Visiting Lecturer in English.*

George Elias, a.b. (Suffolk University), m.a., ed.d. (Boston University), *Visiting Lecturer in Education.*

George Feaver, b.a. (University of British Columbia), ph.d. (University of London), *Visiting Lecturer in Government.*

Azriel Evyatar, D.Sc. (University of Brussels), *Visiting Associate Professor of Mathematics.*

Frank Carmen Grella, B.S. (New York University), M.A. (Columbia University), *Visiting Lecturer in Accounting.*

Marcia L. Halvorsen, B.A. (University of Minnesota), *Visiting Lecturer in Economics.*

Alan Healy, A.B. (Williams College), LL.B. (Harvard Law School), *Visiting Lecturer in Government.*

Mrs. Sheila Hellman, B.A. (University of Alberta), M.S. (University of Massachusetts), *Visiting Lecturer in Psychology.*

Edward Joseph Hill, B.F.A. (Rhode Island School of Design), M.F.A. (Yale University), *Visiting Lecturer in Art.*

Bernard William Hoyt, B.I.E., M.I.E. (Syracuse University), *Visiting Lecturer in Mechanical Engineering.*

Christopher P. Kantianis, B. ARCH., M. ARCH. (Syracuse University), *Visiting Lecturer in Landscape Architecture.*

Frank Rogers Longley, B.S. in E.E. (Georgia School of Technology), M.S. in E.E. (Union College), *Visiting Professor of Electrical Engineering.*

Sydney T. Maunder, E.E. (Syracuse University), *Visiting Lecturer in Electrical Engineering.*

John Caldwell Osgood, A.B., ED.M. (Harvard University), *Visiting Lecturer in Education.*

Mrs. Jeanne F. Potash, B.S. (University of Illinois), *Visiting Lecturer in Education.*

Charles Robertson, B.S., M.A. (Northwestern University), PH.D. (Princeton University), *Visiting Lecturer in Government.*

Peter I. Rose, B.A. (Syracuse University), M.A., PH.D. (Cornell University), *Visiting Lecturer in Sociology.*

Peter Rowe, B.A. (Cornell University), M.A. (American University), PH.D.(Yale University), *Visiting Lecturer in Government.*

Louis Ruchames, B.S.S. (City College of New York), M.A., PH.D. (Columbia University), *Visiting Lecturer in History.*

Stephen Schneiderman, A.B. (Princeton University), A.M. (Harvard University), *Visiting Lecturer in Romance Languages.*

Walter B. Simon, B.S. (College of the City of New York), M.A. (Clark University), PH.D. (University of Indiana), *Visiting Lecturer in Psychology.*

J. Diedrick Snoek, B.A. (Western Reserve University), M.A., PH.D. (University of Michigan), *Visiting Lecturer in Psychology.*

Richard Sollenberger, B.S., M.S., PH.D. (University of Virginia), *Visiting Lecturer in Psychology.*

Hermann J. Weigand, B.A., PH.D. (University of Michigan), *Visiting Professor of German.*

Mrs. D. Bosley Wilder, B.A. (Pennsylvania State University), M.A. (Columbia University), *Visiting Lecturer in English.*

Kenneth M. Yoss, B.S., M.S., PH.D. (University of Michigan), *Visiting Lecturer in Astronomy.*

PART-TIME TEACHING FACULTY

Mrs. Susanna Colton Arnold, A.B. (Clark University), M.S. (Cornell University), *Instructor in Home Economics.*

Mrs. Jean R. Arons, B.S. (University of Massachusetts), *Instructor in Mathematics.*

Mrs. Margaret E. Bigelow, B.A., M.A. (University of British Columbia), PH.D. (University of Michigan), *Instructor in Botany.*

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Mrs. Anne Boas, b.a. (University of South Carolina), m.a. (Teachers College, Columbia University), *Instructor in English.*

Mrs. Gisela E. Brackert, m.a. (Free University of Berlin), *Instructor in German-Russian.*

Mrs. Anne-Helene Burkhardt, b.a. (Emerson College), *Instructor in Romance Languages.*

Mrs. Frances Burstein, a.b. (Washington University), m.a. (Boston University), *Instructor in English.*

Mrs. Alda B. Cannon, b.a. (University of Bordeaux), Certificat d'Etudes Literaires (University of Alger), *Instructor in Romance Languages.*

Joseph Patrick Cebula, b.s.ed. (Westfield State Teachers College), m.a. (American International College), *Principal, Mark's Meadow Laboratory School.*

Mrs. Ann R. Clough, b.s. (University of Massachusetts), *Instructor in Mathematics.*

Mrs. Marilyn H. Damon, b.s. (University of Massachusetts), *Instructor in Mathematics.*

Mrs. Hede Dolch, ph.d. (University of Marburg, Germany), *Instructor in German-Russian.*

Mrs. Aloo J. Driver, b.a. (St. Xavier's College, Bombay University, India), *Instructor in Hindi.*

Mrs. Pamela Edwards, b.a. (University of Massachusetts), m.a. (Smith College), *Instructor in Speech.*

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Charles Fohlin, b.s. in m.e. (University of Massachusetts), *Instructor in Mechanical Engineering.*

Elvin Marshall Fowell, b.a. (Cornell University), m.s. (Syracuse University), *Instructor in Botany.*

Mrs. Ana Maria Cordones Galvin, b.a. (Institute of Secondary Professorship, Argentina), m.a. (University of Massachusetts), *Instructor in English.*

Leonel Gongora, School of Fine Arts, Universidad Nacional, Colombia, S.A., Certificate in Painting (Washington University), *Instructor in Art.*

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Mrs. Katherine K. Knight, a.b., m.a. (Bryn Mawr), *Instructor in English.*

Robert F. Lucas, b.s. (University of Massachusetts), *Instructor in Botany.*

Mrs. Cherry Fabe Michelman, b.a. (Smith College), m.a. (Boston University), *Instructor in English.*

Ann Georgene Moizuk, a.b. (Miami University, Ohio), *Instructor in Botany.*

Mrs. Nancy A. Myers, b.a. (Mount Holyoke), m.a., ph.d. (University of Wisconsin), *Instructor in Home Economics.*

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Mrs. Ruth Skillings, b.a. (Smith College), *Instructor in Botany.*

Harriet Smith, b.a. (Mount Holyoke College), m.s. (Columbia University), m.a. (University of Massachusetts), *Instructor in English.*

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Kenneth W. Washburn, b.s., m.s. (Virginia Polytechnic Institute), *Instructor in Poultry Science.*

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Mrs. Mary Wickwire, b.a. (Wellesley College), m.a., ph.d. (Yale University), *Instructor in History.*

CLINICAL ASSOCIATES OF THE FACULTY OF THE SCHOOL OF NURSING

Florence L. Eaton, r.n., b.s., *Clinical Associate in Psychiatric Nursing.* Northampton State Hospital, Northampton, Mass.

Carolyn V. Furness, r.n., m.s., *Clinical Associate in Public Health Nursing.* The Visiting Nurse Association, Springfield, Mass.

Margaret A. Hogan, r.n., m.a., *Clinical Associate in Maternity Nursing.* Wesson Maternity Hospital, Springfield, Mass.

Jean A. MacNally, r.n., b.s., *Clinical Associate in Public Health Nursing.* Health Department, City of Springfield, Mass.

Anne R. Mitton, r.n., m.a., *Clinical Associate in Nursing.* Wesson Memorial Hospital, Springfield, Mass.

Jeanne S. Murphy, r.n., m.s., *Clinical Associate in Nursing.* Springfield Hospital, Springfield, Mass.

GRADUATE ASSISTANTS

Francine L. Abadie, b.a. (Faculte des Lettres, Paris), *Graduate Assistant in Romance Languages.* Bartlett Hall

Samiha Y. Abdel-Sayed, b.a. (Cairo University), *Graduate Assistant in Romance Languages.* Bartlett Hall

Sadrudin A. Ahmed, b.a. (Washington State University), *Graduate Assistant in Business Administration.* Draper Hall

Muhsen H. Al-Hussaini, b.s. (Montana State College), *Graduate Assistant in Sociology.* Machmer Hall

Mohammed A. Al-Saadi, b.a., m.a. (Montana State College), *Graduate Assistant in Government.* Machmer Hall

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John J. Anzalotti, b.a. (American International College), m.a. (University of Massachusetts), *Graduate Assistant in History.* Bartlett Hall

John W. Arnold, b.s. (Kansas State University), b.a. (Syracuse University), *Graduate Assistant in English.* Bartlett Hall

William E. Arnold, b.s. (University of Massachusetts), *Graduate Assistant in Public Health.* Public Health Center

Naseer H. Aruri, b.a. (American International College), m.a. (University of Massachusetts), *Graduate Assistant in Government.* Machmer Hall

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DELBERT C. GLOVER, B.S. (Fisk University), M.S. (University of Kansas), *Graduate Assistant in Chemistry.* Goessmann Laboratory

HENRY B. GORDON, B.S., M.S. (Drexel Institute of Technology), *Graduate Assistant in Chemistry.* Goessmann Laboratory.

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Vera M. King, b.s. (Tuskegee Institute), *Graduate Assistant in Zoology.* Morrill Hall

Erika H. Kockert, Teacher's Certificate (Magistrar der Stadt, Berlin), *Graduate Assistant in German.* Bartlett Hall

Margarete Koppitz, b.a. (University of Berlin), m.r.e. (Crozier Theological Seminary), *Graduate Assistant in German.* Bartlett Hall

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Michael A. Kulig, b.s.ch.e. (Worcester Polytechnic Institute), *Graduate Assistant in Chemical Engineering.* Goessmann Laboratory

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Yun Shan Lin, b.s. (National Taiwan University), *Graduate Assistant in Chemistry.* Goessmann Laboratory

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Phillip Miller, b.a. (Rutgers University), m.s. (Pennsylvania State University), *Graduate Assistant in Chemistry.* Goessmann Laboratory

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UNIVERSITY OF MASSACHUSETTS ENROLLMENT — SEPTEMBER, 1963
UNDERGRADUATE COLLEGE

Class	1964		1965		1966		1967		Total		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Total
Agriculture	76	2	77	3	91	4	84	8	328	17	345
Arts and Sciences	358	301	539	356	541	413	767	701	2205	1771	3976
Business Administration	118	5	157	8	166	8	129	11	570	32	602
Education	3	100	2	118	1	134	1	126	7	478	485
Engineering	140	1	216	2	209	2	275	2	840	7	847
Home Economics	—	35	—	34	—	44	—	65	—	178	178
Nursing	—	21	—	32	—	41	—	51	—	145	145
Physical Education	29	24	53	24	43	18	30	21	155	87	242
Public Health	6	2	11	16	2	10	1	14	20	42	62
Total	730	491	1055	593	1053	674	1287	999	4125	2757	6882
Total by classes	1221		1648		1727		2286		6882		
Specials									59	113	172
TOTAL											7054

STOCKBRIDGE SCHOOL OF AGRICULTURE

	Men	Women	Total
1964	182	6	188
1965	250	14	264
			452
		Special	2
			454

GRADUATE SCHOOL

Men	Women	Total
964	339	1303

SUMMARY

Undergraduate School	7054
Stockbridge School	454
Graduate School	1303
	8811

Office of Publications, September, 1963

GIFTS AND BEQUESTS

For the information of those who may wish to make a gift or a bequest to this University, the following suggestion is made as to a suitable form which may be used.

There are a number of worth-while activities of the University which are handicapped by lack of funds and for which small endowments would make possible a greater measure of service to our students and to the Commonwealth. The religious work on the Campus is an example. This is now carried on in a very limited way by current private contributions. Further information concerning this and other activities in similar need will be gladly furnished by the President.

Suggested Form

"I give and bequeath to the Trustees of the University of Massachusetts, at Amherst, Massachusetts, the sum of .... dollars."

(1) (Unrestricted)
"To be used for the benefit of the University of Massachusetts in such manner as the Trustees thereof may direct."

or (2) (Permanent Fund: income unrestricted)
"to constitute an endowment fund to be known as the .... Fund, such fund to be kept invested by the Trustees of the University of Massachusetts and the income used for the benefit of the College in such manner as the Trustees thereof may direct."

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"to be used for the following purposes,"
(Here specify in detail the purposes.)

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GENERAL INFORMATION BULLETIN

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A WORD FROM THE PRESIDENT

IN the pages that follow, you will find the University of Massachusetts described as "a place to live, to work, to learn." The University is, in other words, not only a place — but an opportunity. And the emphasis is on people, on teachers and students, on the men and women who contribute to and make our society what it is.

The full resources of the University are therefore always at the disposal of our students, whom we regard as the most important resource of all. And certainly if the young people we accept are to live, work and learn *well*, then we must be sure that they are *interested* and *dedicated people*, who will profitably and effectively participate in all that the University has to offer.

This is important, for the University itself is committed to serving national objectives in one of the most challenging eras of world history. We therefore see our students as integrally involved in helping our society to grow and to contribute in all significant ways to fulfilling these objectives.

In the process, students can derive enjoyment and satisfaction in the largest measure. The University has rich opportunities both in its curricular and extracurricular activities. Those who wisely balance their programs, who place studies first and carefully select other activities, can experience the "connection between knowledge and the zest of life" that is reflected in the program of all true universities.

Cordially,

John W. Lederle

JOHN W. LEDERLE
PRESIDENT

THE UNIVERSITY

THE University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier.

The University is a member of the great community of Land Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry. Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University on its Amherst campus joins with its academic neighbors — Amherst, Smith, and Mount Holyoke Colleges — in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus in Amherst consists of approximately 950 acres of land and 110 buildings. These structures include classroom and laboratory facilities as well as dormitories and other units.

To augment the Commonwealth's facilities at the university level, the University of Massachusetts in Boston will be opened in September, 1965. The new University will offer educational programs comparable in quality to those available on the campus in Amherst. Day sessions, late-afternoon classes, evening school as well as full summer sessions will be offered in the new program.

The total resources of the University of Massachusetts are dedicated to giving all qualified students full opportunities to develop their capabilities for service in a growing society.

Busy morning scene in the central quadrangle.

Autumnal setting near the Student Union.

ADMISSION - - HOW TO GET READY

Applications for admission may be obtained by writing the Admissions Office of the University. *There is no application fee required* at the University of Massachusetts. High school seniors are advised to file their applications early in the senior year. Out-of-state and foreign applications must be received prior to *February 1st*, for fall admission. College Board tests should be taken no later than the January testing date. If they are to be considered during the normal processing, in-state applications should be received by *March 1st*. Thereafter, they may be considered only as vacancies occur. Qualified applicants are admitted at the beginning of the fall and spring semesters and at the beginning of the summer session.

All applicants for admission, except veterans, must take the Senior Scholastic Aptitude Test given by the College Entrance Examination Board. In addition, the University requires three College Board Achievement tests, including English Composition of every applicant whose scholastic record in grades 9 through 11 contains four or more grades below the college recommending mark of his high school. All *postgraduate* students and *out-of-state* students are also required to submit these three Achievement tests. All College Board Test reports must be sent *directly* to the University from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University. Candidates for early admission should, as well, ask the High School to include the junior scores on the application. The Scholastic Aptitude Test may be taken on any of the scheduled dates, although the December testing date is preferred. The May date is too late for seniors, but is appropriate for juniors taking the test for guidance purposes.

An autobiographical letter must be submitted with the application. The University recognizes the importance of a first-hand acquaintance with the colleges a student may be considering, and hopes that he will find it possible to visit the campus for his own information and satisfaction. He should be assured, however, that it will not disadvantage his application if he is unable to do so. The University holds several Guest Days for high school seniors in the fall. These are particularly appropriate times to visit the campus and high schools are notified concerning them. *An interview is, however, not part of the admissions procedure.* It is physically impossible for the admissions staff to interview all applicants; therefore, personal conferences will be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence. If it seems necessary to schedule an admissions counseling conference, it would be prudent for the applicant to make certain that his application and academic records have been received by the Admissions Office prior to his visit so that his situation may be discussed intelligently.

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

High Ranking High School Juniors

Applicants who have completed with very high academic standing work through the junior year may be admitted to the University for the semester following the junior year. Such applicants must take the Scholastic Aptitude and three achievement tests given by the College Board in May of the junior year and make scores satisfactory to the University. They must be highly recommended by their high school principal. The maturity and social adjustment of the applicant will be considered along with his intellectual development. Such applicants should apply before the end of the junior year.

Veterans

Veterans are not required to take the Scholastic Aptitude test. Instead, they must take entrance examinations in Algebra and English and a College Qualification test. These are administered by the University Testing Service in December, May and August. Information in regard to these tests will be furnished the veteran at the time he files his application for admission. Six months Active Duty for Training students are not considered veterans. They must take the College Board Scholastic Aptitude test rather than the Veterans' Examinations. Veterans in college or in full time postgraduate studies at present are considered in the same category as other applicants and do not take the Veterans Tests.

Bachelor of Vocational Agriculture Degree

Superior graduates of vocational schools of agriculture in Massachusetts and vocational agricultural departments in Massachusetts high schools may be accepted for the Degree of Bachelor of Vocational Agriculture, provided:

They are unqualifiedly recommended by the Vocational Division of the Department of Education as *bona fide* Vocational Graduates with

superior ranks; they can present at least 16 units of certified entrance credits, approved as to quality and quantity by the State Department of Vocational Education; they successfully pass the English and College Qualification Test administered by the University Guidance Office. Those who have had algebra will be required to include the algebra examination.

Transfers

A limited number of transfers from approved colleges may be admitted. Since applicants for such transfer exceed the number that can be accepted, they are placed on a competitive basis. Ratings will be based upon high school and college records and on the College Board Scholastic Aptitude Test, which is required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. Applicants for transfer should write the Registrar for a transfer application. At least 45 semester credits taken in residence at the University are required of all transfers who are candidates for the Bachelor's Degree.

SUBJECT REQUIREMENTS

The subjects of preparatory study required for admission call for the satisfactory completion of a four-year high school course or its equivalent and are stated in terms of units. A unit is the equivalent of at least four recitations a week for a school year. High school graduation alone is not sufficient. The applicant's record must indicate capacity for handling the quality of scholastic work which the University has established as its standard of achievement.

Sixteen units of secondary school work must be offered, selected according to the following requirements:

College Preparatory Mathematics	3*
English	4
Foreign Language (2 years of 1 language)	2
U. S. History	1
Laboratory Science	1

The remaining units are elective and may be selected from the following subject matter:

a. Mathematics
b. Science
c. Foreign Language
d. History and Social Studies
e. Free electives (not more than four units)

*Preferably two years of Algebra and one of Plane Geometry.

Free elective subjects are those not included in groups a–d, as for example: Music, art, drawing, typewriting, aeronautics, agriculture, home economics, etc. Such free electives are allowed in order that the student who wishes may have some opportunity to elect other high school offerings, while at the same time covering the fundamental requirements for college work.

Students planning to major in the physical sciences and mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half year of trigonometry. Analytical or solid geometry, chemistry, and physics, and an introduction to analytical geometry and calculus are also strongly recommended.

Students planning to pursue an engineering curriculum should offer two years of algebra, one of plane geometry, and one-half year each of trigonometry and solid geometry. Chemistry and physics are also advised. Those deficient in the mathematics should plan to cover it during the summer prior to entrance or expect to take five years to complete the college course.

Candidates who are deficient in any of the prescribed courses can be considered only if their over-all scholastic records indicate exceptional academic promise.

PHYSICAL EXAMINATION

Physical examination by their personal physician is required of all entering freshmen, re-entering students and all students participating in athletics. Physical report forms for this examination will be mailed to each student with the bill for the first semester and must be completed and returned to the University Health Service 10 days before the opening of the semester. Evidence of a *successful* smallpox vaccination and active tetanus immunization are required.

VETERANS' AFFAIRS

The Veterans' Coordinator is a staff member of the Placement and Financial Aid Services. All veterans affairs should clear through the Placement and Financial Aid Services.

Veterans and eligible dependents of veterans who are entering the University for the first time must present a Certificate of Eligibility at registration. This may be obtained from your nearest Veterans Administration office. Board and room fees must be paid in advance whether the veteran is enrolled under the G.I. Bill or not.

Veterans who are transferring to the University of Massachusetts from another institution or who have done summer work at another institution will be required to submit a supplemental Certificate of Eligibility at registration. This may be obtained by applying through the veterans' office at the institution last attended.

WHAT IT COSTS TO ATTEND

Expenses vary from approximately $1,250 to $1,400 per year for the normally economical student. First year costs are usually greater than those of the other three years and there is less opportunity for earnings. Therefore, a student is advised to have a definite plan for meeting the expenses of the first year before entering.

The following estimate of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly college and does not include amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year. Tuition for residents of Massachusetts is $200 per year and for others $600.

	Normal
Tuition (citizens of Massachusetts)	$ 200.00
Room in college residence hall or private home (approx.)	300.00
Board at college dining halls	448.00*
Athletic Fee	30.00
Student Union Fee	20.00
Student Activity Tax (approx.)	28.00
Student Health Services Fee	40.00
Student Medical Surgical Insurance, 12 months' coverage (optional)	18.00
Books, stationery, and other supplies (estimate)	150.00
	$1,234.00

INITIAL PAYMENT FOR FRESHMEN

The initial payment for first semester expenses required of freshmen at the time of fall registration is indicated below and is made up of the following items:

Tuition (citizens of Massachusetts)	$ 100.00
Room rent in college residence halls (approx.)	150.00
Board at college dining halls	224.00*
Athletic Fee	15.00
Student Union Fee	10.00
Student Activity Tax (approx.)	14.00
Student Health Services Fee	20.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	18.00
Physical Education Equipment Fee (men only)	10.00
Books, stationery, and other supplies	100.00
	$ 661.00

These are only approximate figures. A bill will be rendered to the parent of each student prior to the beginning of the semester.

*Above plan for 7 days; 5-day plan available for approximately $370.00 per year or $185.00 per semester.

TUITION

As a state institution the University of Massachusetts offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a "bona fide" residence in the Commonwealth with the intention of continuing to maintain it as such.

The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation the student, in addition to the requirements of these regulations, respecting residence, shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of the husband.

The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University. Students receiving credit by special examination must pay $5.00 per credit to be received before the examination may be taken.

ROOM AND BOARD

The University provides accommodations in residence halls for a large number of its students. Freshmen, sophomores and juniors, unless 21 years of age, are required to live in University residence halls unless excused by the Dean's office. All freshmen, sophomores and juniors residing in University residence halls will be required to board at University dining halls, except that such students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities. Any student not required to board on campus may eat at the Dining Commons on a cash basis.

SUMMER ORIENTATION FEE

Members of the incoming freshman class attending the summer orientation program will pay a non-refundable fee of $15.00 to cover the cost of meals, housing, testing and counseling.

PAYMENT DUE DATES

In accordance with University policy, all charges for tuition, fees, board and room rent in University dormitories are due and payable twenty-one days prior to the date of registration of each semester. Bills will be rendered in advance and payment may best be made by mail. Students may not register until all University charges are paid.

A WORD ABOUT FINANCIAL AID

Scholarships, loans, and part-time employment are available for a limited number of needy and deserving students. A limited number of such grants are available to entering freshmen who have made outstanding records in high school. Applicants for scholarships must file the Parent's Confidential Statement prepared by the College Scholarship Service when the Admissions Application is sent, or no later than March 1st of the admissions year. Students may also apply for certain kinds of loans, including those available under the National Defense Student Loan Program, University loans (after the first semester of the freshman year), and the Higher Education Loan Plan (at the end of the freshman year). Also, students may engage in part-time work after the completion of the first semester of their freshman year. Information about each of these programs may be obtained by writing to the Director of Placement and Financial Aid Services. Veterans or dependents of veterans who are eligible for benefits may also apply to this office for information.

A PLACE TO LIVE, TO WORK, TO LEARN

HOW can I make the most of my college career? Every student asks this question just before the start of his freshman year. Specific answers usually wait until the student is actually in college where teachers and advisers help him to decide on the major course of study he should pursue. Often, of course, a student has already made a decision about his "major," and if the decision is based on a sound assessment of aptitudes and abilities, this is all to the good.

But even for students who are sure about what they want to "take" in college, the question is still very important. The danger in approaching college work lies in the assumption that this is, as with many other activities, "just a routine." As a student reads the general catalogue, he finds rules, regulations, requirements, and prescribed courses of study. All these tend to make him feel that the curriculum is indeed just a routine for getting enough credits to graduate.

For many students this is certainly true. But for the wise student, the word "routine" is supplanted by the word "adventure." The rules, regulations and requirements are not thereby eliminated, for every college must have the means of order and stability by which to achieve basic objectives. But the good student recognizes that he need not work merely to satisfy *minimal* requirements: he can do much more. If he learns early that thought is not locked within the four walls of a classroom, if he is alive with interest, if he realizes that his four years in college will be the best he will ever have for stocking his mind and exercising his imagination, then his "prescribed course of study" will become a springboard to a fascinating realm of knowledge and ideas that only he himself can attain.

The following paragraphs, therefore, are simply intended to show what the University can offer a student, what it requires of him, and what he must do to fulfill these minimal obligations. Beyond these basic offerings and requirements lies the real adventure—the adventure in learning.

A YEAR-ROUND OPERATION

The University conducts its program on virtually a year-round basis. The regular two semesters of the academic schedule are supplemented by a two-term summer session in which a student can earn nearly the equivalent of a full semester's work. Combining the work of the regular academic year with a complete schedule of courses in the summer sessions, students can finish their college careers in three years instead of four. The summer session is open to all freshmen who wish to begin their college education immediately following graduation from high school. It is also available to high school juniors who are accepted for study at the University under the Early Admission Plan (see below under Program for Superior Students).

THE ACADEMIC PROGRAM

The University consists of two main divisions, the four-year undergraduate curriculum and the Graduate School. Instruction in the undergraduate program is assigned to the College of Arts and Sciences, the College of Agriculture, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education, and the Department of Public Health. A qualified student may enter any one of these units and

work toward the appropriate bachelor's degree, as described on Page 11. The total program is built around a core of studies designed to provide a sound general background. Beyond this, the student elects a program within a particular branch of learning in order to prepare for advanced study in that field or for a career in one of the professions. Offerings in the various branches range from accounting to zoology, and a student electing any major course of study has opportunities for a comprehensive education in the four-year program. Descriptions of the courses of study offered in each of the undergraduate branches can be found in the section beginning on Page 12.

THE PRELIMINARIES: FRESHMAN ORIENTATION

All students entering as freshmen must attend a two-and-a-half-day orientation program at a specified time during the summer prior to entrance. The program consists of testing, counseling, and pre-registration for courses to be taken during the coming semester. Guidance and placement tests are given and scored, and each student is assigned a faculty adviser who will help in the selection of courses and planning of a class schedule. On the final day of each of these periods, a special program is held for parents so that they may learn about the student's proposed courses and schedule for the fall semester, the results of the testing sessions, and the facilities and opportunities available at the University.

GENERAL UNIVERSITY SERVICES

The University is a community of individuals working toward a common goal—the acquisition and dissemination of knowledge. As a community, therefore, the institution has all of the adjunct resources needed to further that goal and to provide for the general well-being of the community's members.

Thus, the University maintains an extensive library system, both through the University Library and the 30 departmental and laboratory libraries. In addition, the University is a participating member in the Hampshire Inter-Library Center, housed at the University and containing journals, documents and reference sets for use in study and research. The Center is jointly operated by Amherst, Smith, and Mount Holyoke Colleges and the University under the Four College Cooperation Program engaged in by the four area institutions.

Concerned as it is with the need for spiritual undergirdings for the educated man, the University gives support to the religious life of its students in various ways. It affords the use of facilities for student groups of all faiths, and it honors the work of the Campus Religious Council which provides a cooperative interrelationship among religious groups. Chaplains are assigned to campus by the various faiths, and students are urged to meet with their own chaplain upon coming to the campus.

The University's Health Service, housed in one of the newest buildings on campus, is concerned with the total health of individuals and groups, as reflected in the need for complete physical, mental and social well-being. The new infirmary contains a fully-equipped out-patient department, X-ray and laboratory resources, and physiotherapy facilities. The Health Service staff of physicians, technicians and nurses is devoted to promoting good physical and mental health, conditions of safety, and other factors affecting the health of students in the campus community. In addition, the University maintains a Speech and Hearing Center to assist students and others with speech and hearing problems.

GRADING SYSTEM

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below. The quality point average required for continued enrollment and for graduation is set by the Faculty Senate. At present the graduation requirement is a cumulative average of 1.80.

Grades are reported according to a letter system, as follows: A—Excellent, B—Good, C—Average, D—Passing (but not satisfactory), F—Failure, and Inc.—Incomplete. Quality points per semester hour are assigned as follows: A, 4; B, 3; C, 2; D, 1; and F, 0. To compute the semester grade point average, as well as the cumulative average, the total points earned are divided by the total credits carried. Any student whose semester quality point average falls below the cumulative requirement is warned of his status by the Registrar and informed of the rules governing dismissal. Students who achieve high averages are placed in one of three honors groups each semester, as follows: First Honors: 3.8 or higher; Second Honors: 3.4 to 3.7 inclusive; and Third Honors: 3.0 to 3.3 inclusive.

ADVISORY SYSTEM

In order that, from the day he enrolls, the freshman may have someone to whom he may go for consultation and assistance, each student selects a tentative educational objective and is assigned a faculty adviser within that academic area.

In the second semester of the freshman year, each student is given an opportunity to change to a new department or to remain in his current department. In succeeding semesters, students may change to another major department by execution of a Major Change Card (available in the Registrar's Office). It is the function of this adviser to help the student in adjusting himself to the work and life of the University. Academic progress reports issued by the Registrar's Office are sent to the advisers periodically, and the students are expected to report to their advisers from time to time to discuss

their academic standing. The University also forwards reports of academic standing to the parents. Both students and parents are encouraged to consult with the adviser whenever there are problems regarding studies or personal adjustments to college life.

PROGRAMS FOR SUPERIOR STUDENTS

The University regularly provides superior students with challenging educational programs extending from the freshman through the senior year. Under the Early Admission Plan, the University considers applications from students of high standing who have completed their junior year of secondary school.

Many entering students are able to achieve advanced standing and credit for college-level courses successfully completed in their secondary schools as part of the College Entrance Examination Board Advanced Placement Program or an equivalent. The University also administers a number of its own advanced placement tests. A student who demonstrates he is proficient in a basic college subject may by-pass the beginning course and go on to advanced work in the subject. Upon attaining satisfactory standing in many of these courses, students are granted academic credit for the courses by-passed. Also, up to thirty semester hours of credit may be granted students of high standing who can fulfill the requirements of some of their courses through independent study.

The major feature of the program for superior students is the honors curriculum available to all who qualify. Freshmen are eligible for the Honors Colloquium program conducted for the first three undergraduate classes.

The Senior Honors Program recognizes merit and gives highly qualified students time and opportunity for independent study under closer, more personal direction than is ordinarily provided in the University curriculum. Students who complete their work satisfactorily are eligible for graduation with honors.

STUDENT HOUSING

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus dormitories and be required to eat at University dining halls unless given permission to commute from their parents' home or to live at sorority or fraternity houses. University board is optional for seniors and is available on a cash basis. Sororities and fraternities may furnish regular board to members up to the approved capacity for each house. Students who are assigned to housing operated by the University are expected to remain for the academic year and may not be released sooner except as their places are taken by suitable substitutes. The University reserves the right to change room assignments whenever necessary.

Most dormitory rooms are double and are furnished with beds, mattresses, desks, chairs, and a chest of drawers. Students care for their own rooms and are responsible for any damage. Dormitories open for occupancy on the day immediately preceding the opening of the University. All student property must be removed from the rooms and the key turned in immediately after final examinations in June. Such property not removed by the owner will be removed by the University and stored at the owner's expense. Students assigned to dormitory rooms will be responsible for the room rent of the entire semester. Room rent is not refundable. Room rental charges do not include the several regular school vacation periods. The University reserves the right to utilize student rooms during vacations for conferences and other groups which meet occasionally on the campus.

APARTMENTS FOR MARRIED STUDENTS

The University owns and operates two groups of apartments: Lincoln Apartments for junior faculty, married graduate and undergraduate students, and the County Circle apartments for married graduate and undergraduate students. Apartments are unfurnished with the exception of kitchen units which contain an electric range and refrigerator. Apartments are assigned as of date of availability. New junior faculty, married graduate students and undergraduate students with children receive consideration in that order. Further information and applications may be obtained from the University Housing Office, Draper Hall.

AUTOMOBILES

Only members of the senior class, students 21 years or over, and commuters are permitted to have automobiles or other types of automotive equipment on the campus or in the Town of Amherst. Vehicles must be registered with the Campus Police. Driving to and from classes is not permitted. Exceptions may be made in the case of an individual who has a severe physical limitation. Requests for such exceptions must be made through the University Health Service.

STUDENT ORGANIZATIONS

Participation in extra-curricular activities offers opportunities for furthering the broader objectives of a college experience. The knowledge, skills and judgment developed in the classroom can be tested and refined through use in the organizational setting. Thus, more than fifty professional clubs exist on campus as a means of stimulating vocational interest through close contact with members of the teaching staff and representatives of the professions. Student government offers a forum for debate on matters of importance to the entire University community. For those interested in communications, there are several campus publications as well as an FM radio station. Experience in music and drama is available in a number of forms.

Such activities can be a profitable means of fostering maturity and general enrichment in those students who wish to take optimum advantage of all that the University can offer. In encouraging participation in these activities, the University asks only that students plan their time well, in order that they may profit as much as possible from a total University program devoted, first and foremost, to academic studies.

All extra-curricular activities are supervised by the Committee on Recognized Student Organizations composed of alumni, faculty, and students. Recognition for outstanding achievement in this area is given at an annual Student Leaders Night held in the spring. An office devoted to administering and assisting in the conduct of student activities is located in the Student Union. Detailed information about student organizations may be obtained by contacting the Recognized Student Organizations Adviser.

INTERCOLLEGIATE AND INTRAMURAL ATHLETICS

The University maintains well-organized intercollegiate and intramural sports programs. In intercollegiate athletics, the University is represented by teams in all the leading sports, including football, soccer, cross-country, basketball, swimming, wrestling, indoor and outdoor track, hockey, rifle and pistol, baseball, tennis, golf, lacrosse, gymnastics, skiing.

The University also supports a broad program of intramural activities, in which all students are encouraged to participate. The range of sports available each year includes the team sports of touch football, basketball, softball, volleyball. Individual activities include tennis, bowling, badminton, golf, tennis, swimming, and lacrosse.

PLACEMENT SERVICES

The University maintains an Office of Placement and Financial Aid Services whose responsibilities include vocational and financial counseling and the administration of the affairs involved in aiding students to seek appropriate positions and careers; the granting of loans and scholarships; the assignment of part-time work; the coordination of veterans' affairs; and the dissemination of information relative to military service through the draft or reserves. While providing vocational and career counseling for all undergraduates, the emphasis is on aid to seniors in planning their future following graduation and providing them with job-hunting techniques and other media for finding permanent employment. Actual contact with employers is provided during the year when employers from business, industry, schools, and other sources visit the campus to interview prospective graduates.

Cumulative student personnel records; occupational information and industrial literature libraries; preparation of credentials including personal resumes and recommendations coupled with counseling and guidance are provided to enable senior men and women to accomplish their career objectives consistent with their interests, abilities, aptitudes and education.

THE PROGRAM AND ITS OPPORTUNITIES

The University offers four-year undergraduate curricula leading to the following degrees: Bachelor of Science, Bachelor of Arts, Bachelor of Science in Chemical, Civil, Electrical, Industrial and Mechanical Engineering, and Bachelor of Business Administration. Work toward these degrees is carried on in the College of Arts and Sciences, the College of Agriculture, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education, and the Department of Public Health. Special arrangements are made for some graduates of county agricultural schools and of agricultural departments of certain high schools to complete the college course with majors in agriculture and horticulture. Upon completion of their course, these students are granted the degree of Bachelor of Vocational Agriculture.

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The aim of the four-year course is to give the student as high a degree of proficiency in a particular branch of learning as is possible without sacrificing the breadth, knowledge and general training which should characterize a well-rounded college education. Under this philosophy, the University has made recognized contributions, through its graduates, to the life and culture of America. University alumni hold positions in government, education, business, science and engineering, the arts, medicine, law, and many other professions. With rising enrollments, the University is educating ever greater numbers of young men and women for significant careers and important contributions to American society.

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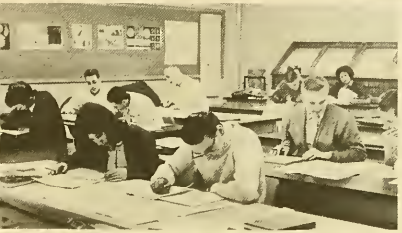
The following pages are designed to give some indication of the variety of such opportunities open to students who are accepted for admission. Descriptions of curricula are given in brief and general terms so that prospective applicants may become quickly acquainted with the entire range of offerings. Graduation requirements for each curriculum have been omitted, principally because a student admitted to the University will have ample opportunity to acquaint himself with such requirements after he has arrived on campus. Courses required in the freshman year, on the other hand, are included in the section beginning on Page 29. Further information on various phases of the major courses of study may be obtained from the Deans of the Colleges and Schools or from the Registrar. Information about other aspects of the University program may be obtained from the appropriate offices listed on Page 32.

COLLEGE OF ARTS AND SCIENCES



I. Moyer Hunsberger, ***Dean***
Robert W. Wagner, ***Associate Dean***
Bartlett Hall

The College of Arts and Sciences offers instruction in the fine arts, the humanities, the social sciences, the natural sciences, and mathematics both for students enrolled in the College and for those in other undergraduate divisions of the University. The program provides for the breadth of intellectual development essential to a liberal education and for concentration which is the necessary foundation for competence in a selected discipline.

The Bachelor of Arts degree may be earned by students majoring in any division of the College. The Bachelor of Science degree may be earned by students in the natural sciences, mathematics, or psychology.

The following major courses of study are available in the College:

ART. The Department of Art is interested in providing two kinds of training: first, to give each student a good general historical and aesthetic knowledge of the arts; second, to give each student an opportunity to develop his creative ability in the several media of the arts.

ASTRONOMY. A Department of Astronomy conducted jointly with Amherst, Mount Holyoke, and Smith Colleges provides instruction in this field. All advanced courses are given on a joint basis for students from the four participating institutions.

BOTANY. Programs in botany prepare students for teaching and research in biological sciences in high schools, universities, industry, and experimental stations.

CHEMISTRY. The prime purpose of the Department of Chemistry is to offer sound preparation for graduate study in chemistry. Accordingly, emphasis is placed upon intellectual accomplishment and broad understanding rather than on terminal training for specific chemical tasks. The program designed for this purpose also affords sound preparation for direct entry into chemical industry, chemical institutes, or governmental laboratories.

ECONOMICS. In economics the aims are twofold: (1) to give the student an understanding of economic theory and of the application of economic principles to the organization of society; (2) to provide students with the elementary training necessary for further study and solution of economic and business problems.

ENGLISH. The major in English affords the student opportunities to improve his knowledge of the English language and his ability to use it clearly, logically, and artistically; to increase his knowledge of Western literature written in English or translated with distinction into English; to read and discuss a literary work with perception and understanding, and to form an independent estimate of it by valid critical standards.

GEOLOGY. For students considering geology as a career, the opportunities are many. Those interested primarily in basic science may look to positions

in teaching, in museum work, on state and federal surveys, and in various research organizations. Those concerned mainly with applied science may direct their efforts toward work in mining geology, petroleum geology, engineering geology, and ground-water geology, and industrial mineralogy.

GERMAN. The courses in German are intended to give a practical knowledge of the language for the purpose of wider reading, research, and oral communication.

GOVERNMENT. The courses offered by the Department of Government are designed to aid the student in gaining a knowledge of the nature, functions, and problems of government, and of the place of government in the modern world. Political theory, constitutional law, international relations, comparative government, politics and public administration are the principal areas covered.

HISTORY. Courses in history are designed to provide an understanding of man through a study of patterns of development in the past. The study should also give the student an introduction to major problems in world affairs.

JOURNALISM. The journalism program is concerned with (1) the study of writing and of communication problems relevant to the media of mass communication, and (2) the best utilization of the University's liberal education resources by students who plan careers in newspaper work, communications research, public relations, magazine and radio journalism, or some other field of communications.

MATHEMATICS. The department offers courses designed to furnish a cultural background as well as a foundation for both undergraduate and graduate work in mathematics, statistics, physics, chemistry, engineering, econometrics, and biometrics.

MICROBIOLOGY. The courses in microbiology are designed to aid the student in acquiring special knowledge of the nature and function of the micro-organisms and to provide an appreciation of the role of experimental biological science in widening man's horizons.

MUSIC. The undergraduate major program in music is pre-professional, so that courses, music organizations, and private study are the means used to prepare each student. Other undergraduates may minor in music, or follow a sequence of courses for continuing study.

PHILOSOPHY. Philosophy seeks a comprehensive understanding of the various areas of man's experience in their interrelatedness. In the context of the historically important theories, the courses concentrate on methods of inquiry into the persisting questions of philosophy, standards of thought, clarification of ethical and aesthetic values, and the basis of criticism.

PHYSICS. Courses are designed to accommodate students who desire specialized training in physics, and also to provide required or elected courses for students majoring in engineering, mathematics, chemistry, or other fields.

PRE-MEDICAL AND PRE-DENTAL CURRICULUM. Pre-medical and pre-dental students are assigned to faculty advisers for their freshman year. At the end of their second semester, they will be assigned to a member of the Upperclass Committee who will be their adviser for the remainder of the course of study. Pre-veterinary students may register in the College of Agriculture or College of Arts and Sciences.

PSYCHOLOGY. The courses in the Psychology Department are planned (1) to impart an understanding of the basic principles, methods and data of psychology as a science and the application of this knowledge to problems of human adjustment; (2) to prepare some majors for graduate study which may lead to a professional career in psychology; and (3) to help prepare others for non-professional careers. In carrying out these aims, majors are urged to elect, with the help of a departmental adviser, a broad program of courses.

ROMANCE LANGUAGES. Three majors are offered: French, Spanish, and Classics—the latter through cooperation with Amherst, Smith, and Mount Holyoke Colleges. The courses of these curricula are intended to give (1) a thorough training in the language skills, (2) an appreciation of the aesthetic and intellectual qualities of the literatures, and (3) a serious insight into the cultures of the nations concerned. Language and literature courses in Portuguese and Italian also are available.

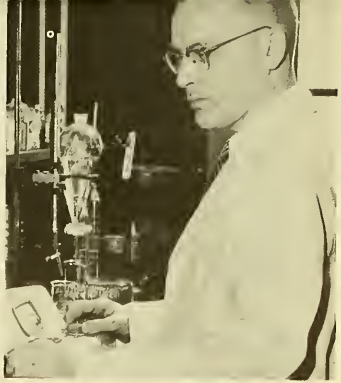
RUSSIAN. Students choosing Russian as their field of major concentration will receive training in reading, writing, speaking and understanding the language, and a knowledge of Russian literature. Russian majors will also acquire the background in Russian history, government and economy necessary for an understanding of the literature and culture of the Russian people.

SOCIOLOGY AND ANTHROPOLOGY. Students may major either in Sociology or Anthropology. Courses are planned with two aims in view: to give the student an understanding of the factors which influence men in their activities and interests as members of society, and to help prepare students for a wide variety of occupational outlets, including social work.

SPEECH. An undergraduate major in speech may be earned by completing thirty semester hours of course work in the department although nine of these may be earned in English and philosophy. Psychology 26 should be elected as a basic requirement. The student must select an area of concentration in (1) Rhetoric and Public Address, (2) Interpretation and Theatre, (3) Radio and Television, (4) Speech Education, (5) Speech and Hearing Therapy.

STATISTICS. Although there is no undergraduate major in statistics, the courses are designed for those who are preparing for graduate work in statistics or for those who require statistics as a basic preparation for their own subject-matter discipline.

ZOOLOGY. The courses in zoology have two major aims: (1) to offer students an opportunity to develop an understanding and appreciation of the scientific method as a part of a liberal education; and (2) to provide training for prospective graduate students in biology, medicine, dentistry, and related fields, as well as future teachers and laboratory technicians in the biological sciences.



COLLEGE OF AGRICULTURE

Arless A. Spielman, *Dean*
Stockbridge Hall

The College of Agriculture offers a broad general education with specific training in a specialized area. Upon the completion of the requirements for the Bachelor of Science degree, the student will have devoted about one-quarter of his time to pure science, one-quarter to social and humanistic studies, and about one-half to applied science and technology. A broad choice of electives within the required courses of each curriculum gives the student the opportunity to prepare for a career in research, industry, business, education, conservation, services. Each department of the College has specific requirements for graduation which are included in the General Catalog under the name of the department. During the first semester of the freshman year, students interested in teaching vocational agriculture, extension work, or specializing in research work, should consult with the head of the department in which they plan to major.

For those students interested in a two-year program in food and agricultural industries, the University provides offerings in the Stockbridge School. A separate bulletin describes these offerings in detail.

The four-year courses of study available in the College of Agriculture include the following:

AGRICULTURAL AND FOOD ECONOMICS. This curriculum is designed (1) to prepare students for employment in executive positions with firms related to agriculture or for administrative positions with governmental agencies concerned with agriculture and (2) to give the essential undergraduate preparation for a career in agricultural economics, in research, teaching, or extension work. The course of study, which leads to the degree of Bachelor of Science, combines training in technical agricultural sciences with courses in business management and economics.

AGRICULTURAL ENGINEERING. Agricultural engineering is concerned with the application of scientific engineering principles to agricultural industries. This professional field includes engineering activities related to the design, development and use of mechanical and electrical equipment; structures; and soil and water control systems for the production, processing and preservation of agricultural products and the improvement of rural living. Agricultural engineers are employed by a variety of agricultural industries and organizations for research, development, teaching, and promotional activities.

Shown above, on left, is Stockbridge Hall, center of activities in College of Agriculture. On right, research in animal science. Lower panel pictures modern laboratory facilities in the College of Agriculture: equipment for chemical treatment of wood (Forestry); work in gas chromatography (Food Science); and laboratory in foods research.

ANIMAL SCIENCES. The curriculum in the animal sciences, including poultry, is designed to provide fundamental training and knowledge in the comparative nutrition, physiology, breeding, selection and management of various classes of livestock and to understand the role of animal production in the national and world economy. The curriculum provides for an important degree of flexibility depending upon the students' interests and abilities. Options emphasizing commercial animal production are supported by electives in agricultural economics, agricultural engineering, and business administration. Students interested in graduate work in such specialized areas of the animal sciences as nutrition, physiology or genetics should elect programs with special emphasis on the basic sciences.

ENTOMOLOGY. Courses in entomology acquaint students with all phases of insects and insect control, as well as beekeeping. Trained entomologists find positions in public service and industry, such as teaching at all levels; research, quarantine and regulatory work in State or Federal Service, various roles in public health and pest control activities; research, sales and public relations work in the agricultural chemicals industry; and commercial beekeeping.

FOOD SCIENCE AND TECHNOLOGY. The curriculum in Food Technology provides scientific and applied training in the principles concerned with the processing, preservation, and packaging of foods and food products. The student's background in chemistry, physics, and microbiology is applied to food technology problems and food analysis. Major fields open to graduates include: (1) technical and production work in the food industries; (2) quality control and analytical work related to food products; (3) government food inspection and grading; (4) technological work and research in government, industry, and education.

FORESTRY. The technical curriculum in forestry is concentrated in the field of forest production and management, and leads to the degree of Bachelor of Science. It has professional status, being accredited by the Society of American Foresters. Graduates are prepared for employment with Federal and State agencies and in private industry.

LANDSCAPE ARCHITECTURE. Students following this curriculum, which requires 125 credits for graduation, are prepared through a broad academic approach to take up work in the various phases of landscape architecture. This applied design profession is concerned with the development of land for human use and enjoyment. In addition to the usual areas of interest, such as site planning for private, semi-public and public works of many types, considerable city and regional planning is now available for those interested.

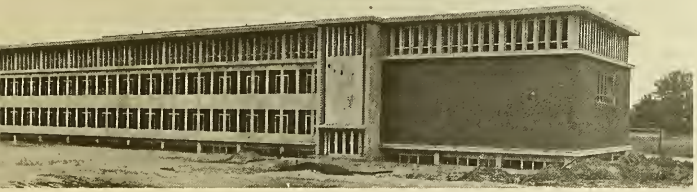
PARK MANAGEMENT. A new course of study for those planning a career in park management or administration. In addition to landscape design this program permits the student to elect widely from the biological and social sciences.

PLANT AND SOIL SCIENCE. The major in plant and soil science permits specialization in many areas of agronomy, soil science, horticulture and plant pathology. Emphasis is on basic sciences that will prepare students for a wide variety of careers in research, teaching, industry, business, marketing, sales, production, control and regulatory services with state and federal agencies. The major in plant science will be required to take a basic core group of subjects related to the physical, biological, and social sciences as well as the humanities.

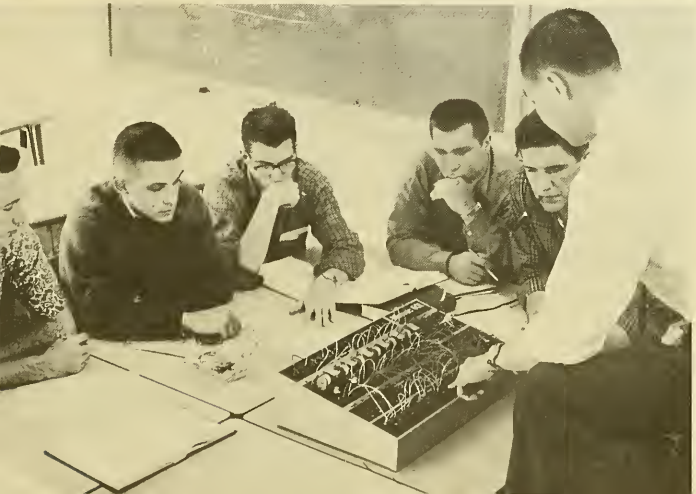
PRE-VETERINARY. Students may enroll in either the College of Arts and Sciences or in the College of Agriculture. The two-year pre-veterinary curriculum provides 64 semester credits and satisfies the requirements of those veterinary schools which have accepted the largest number of Massachusetts students in the past. Departure from this curriculum necessitates more than two years in preparation. Students who anticipate three or four years of college work in preparation for veterinary school should be guided by the requirements of the pre-professional curriculum.

RESTAURANT AND HOTEL MANAGEMENT. The curriculum in Restaurant and Hotel Management is offered by the Food Science and Technology Department. The program is designed to give the student a general well-rounded background of arts and sciences, coupled with training in subjects useful to the hotel, restaurant, and other food service industries. The nature of the food service industry requires persons with broad, general backgrounds of business training coupled with a scientific knowledge of foods.

WILDLIFE AND FISHERIES BIOLOGY. Wildlife and fisheries biology is concerned with the acquiring and application of knowledge concerning terrestrial and aquatic animal populations which are of recreational or commercial value. This knowledge includes the dynamics of animal populations and their responses to changes in environmental conditions, including changes incurred by land use and direct exploitation by man. A broad understanding of geology, forestry, soils, agriculture, botany, and zoology is required.



SCHOOL OF BUSINESS ADMINISTRATION



H. B. Kirshen, *Dean*
School of
Business Administration Building

The School of Business Administration prepares students to take advantage of important economic opportunities and eventually to assume positions of responsibility in business. The School's educational program is directed toward the broad aspects of business, encouraging high standards of ethical conduct, broad social responsibilities and the development of competence in particular courses of study.

The first two years emphasize general education by providing fundamental courses in the humanities, mathematics, science and social science. In addition, basic courses in accounting and economics prepare the student for further work in the School of Business Administration. The junior and senior years emphasize a greater degree of specialization and provide for this in the programs indicated below. But even in these last two years all students need to view business as a whole in so far as a "core" of courses can do this. This "core" of courses is listed below and is required of all students. A total of at least 120 credit hours is required (122 in Accounting) for graduation exclusive of credit received in the required physical education courses. Each course of study leads to the degree of Bachelor of Business Administration.

All students in the School of Business Administration must attain, as a graduation requirement, a 2.0 average in Accounting 25 and 26, Elementary Economic Statistics 21, and the junior "core" courses: Finance 55, Financial Institutions; Finance 65, Corporation Finance; General Business 71, Business Law 1; Management 61, Principles of Management; and Marketing 53, Principles of Marketing. The "core" must be completed by the end of the junior year unless a student, on recommendation of his department chairman, has received permission from the Dean to postpone any such course to the senior year.

Students transferring from any School or College within the University shall receive junior and senior elective credit only for those courses passed with a grade of C or better.

Students transferring from outside the University as juniors or seniors must complete a minimum of 12 credit hours in courses offered by his major Department.

Student transferring from junior or community colleges should complete two years of a program in the Liberal Arts including only the one year course in Accounting and in Economics.

Above is the recently completed School of Business Administration building.

Below, a class in computer techniques for business analyses.

The School of Business Administration is a member of the American Association of Collegiate Schools of Business.

Major courses of study are available in the School of Business Administration as follows:

ACCOUNTING. The accounting program is designed to prepare students for public accounting and for positions as accountants in business, industry and government.

GENERAL BUSINESS AND FINANCE. The department has four major programs: *Finance, Business Administration and Economics, General Business* and *Urban and Regional Studies.* The curriculum in finance is directed towards the fields of banking, investment, brokerage, insurance or governmental agencies concerned with finance. The curriculum in Business Administration and Economics comprehends a wider field to balance a knowledge of both economics and business. The curriculum in General Business was designed for students who do not wish to specialize in any particular field. The curriculum in Urban and Regional Studies is an interdisciplinary program directed toward the problems of metropolitan areas.

MANAGEMENT. Industry and business offer qualified students an opportunity to find careers in General Management, Production Management, and in Personnel Management and Industrial Relations. Course programs are offered in each of these fields and provide the student both a specialized and a comprehensive understanding of the managerial process in industrial enterprises.

MARKETING. Students in marketing prepare for a variety of positions in wholesale and retail enterprises and in the sales activities of manufacturers. The program includes specialized study of basic types of market operations such as advertising, sales management and retailing.

Students in the School learn to use complex office machines.

Periodicals library in the School of Business Administration.

An advanced class in general business and finance.

SCHOOL OF EDUCATION

Albert W. Purvis, *Dean*
School of Education Building

The School of Education through its undergraduate program seeks to utilize the forces of the University to prepare teachers for elementary and secondary schools and through its graduate offering to prepare administrators and specialists in public education. Its program is based upon the assumption that teachers and other school personnel should have a broad liberal education, considerable mastery of at least one field, and professional courses which should lead to a knowledge of the persons to be taught, familiarity with the problems to be met, and practice in the best techniques of teaching and supervision. In all of this the School of Education takes the position that teacher education is a University function and that success will come only if the School is successful in maintaining the closest possible relationships with other schools and departments that contribute to the program.

All students who contemplate teaching as a career should register early, in their freshman year if possible, with the School of Education although their courses in education do not begin until the junior year. In general, students are admitted without question to the various service courses of the junior and senior years, but admission to the teacher-training program of the concentrated semester block is determined by a composite rating based on scholarship as shown by University grades (a three-year average at least as high as the University median is desired), success in the beginning courses in education, recommendations of University teachers in general education fields, and personality ratings by members of the staff.

ELEMENTARY SCHOOL TEACHING. Candidates for this program major in elementary education. In certain cases, with the approval of the Dean of the School of Education, the student may be permitted to major in some department of the College of Arts and Sciences where the general education program is deemed the equivalent of that designed for elementary education majors. This permission should be requested in freshman year. Such students will satisfy the requirements of their major department so far as the first two years are concerned but they should utilize their electives to take such courses as Government 25, Zoology 54, History 25, 26 and Art or Music which are recommended by the School of Education. They should take Education 9, 39, 59. The core program for elementary education majors including Education 51 and 64, and Psychology 65 or Home Economics 70, Music 85 and the Elementary Education Block should be taken in the junior and senior years.

SECONDARY SCHOOL TEACHING. All candidates for secondary school teaching will major in the subject field to be taught and minor in education. A maximum of eighteen hours should be taken in this minor. Education 51 and Psychology 56 are required during junior year and Education 52, 88, 85

Above, the new School of Education building. Below, a laboratory in remedial reading techniques.

(called the secondary block) in one semester of senior year. Since the concentrated semester block in secondary school teacher-training carries only twelve credits for some majors, students should consult with their major adviser regarding means of making up the extra three credits, and of meeting all their major requirements in the three semesters of junior and senior years.

SPECIAL FIELD PROGRAMS FOR PROSPECTIVE TEACHERS. In Vocational Agriculture (R. C. Jones, adviser). This program is based on a cooperative agreement between the University and the Vocational Division of the State Department of Education which provides supervisors and consultants in conducting the program. Students otherwise qualified may prepare to teach vocational agriculture by the satisfactory completion of Education 72, 73, and 75. Education 52 is also recommended. To insure a desirable range of preparation, students who contemplate vocational teaching should consult, early in the freshman year if possible, Professor Jones and Mr. T. McGarr.[1]

[1]Mr. McGarr is State Supervisor for Agricultural Teacher-Training representing the Vocational Division of the State Department of Education in the administration of vocational agricultural acts.

A vocational teacher-training certificate is awarded by the Vocational Division to those who fully qualify.

In Home Economics (Mrs. Marjorie Sullivan, adviser). These students will major in home economics and minor in education. They should elect Education 51, Psychology 56, Home Economics 81 and the concentrated semester block (Education 52, 85).

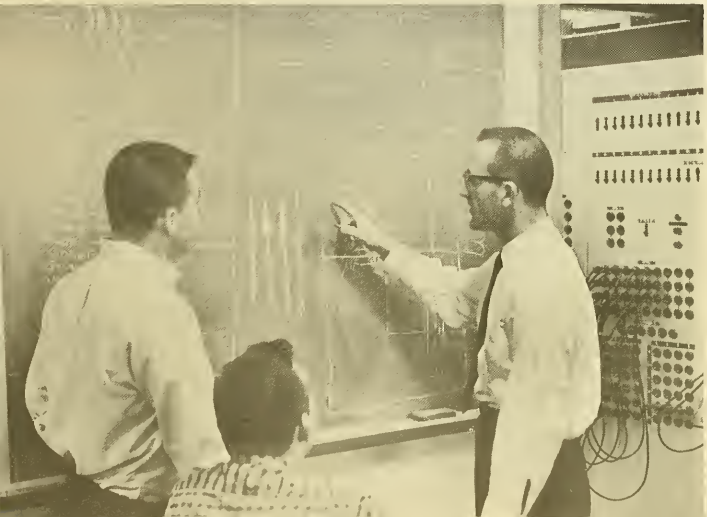
In Teacher Coaching (S. W. Kauffman, adviser). These students will major in physical education and minor in education. They should elect Psychology 56 and the concentrated semester block (Education 52, 88, 85). They should elect a minor teaching field from the College of Arts and Sciences consisting of a minimum of eighteen hours.

In Music (D. Alviani, adviser). These students will major in music and minor in education. They should elect Education 51, Psychology 56, Music 87, and the concentrated semester block (Education 52, 85).

Class in audio-visual methods.

Students observing a classroom in the Mark's Meadow Laboratory School.

SCHOOL OF ENGINEERING



E. E. Lindsey, Acting Dean
Main Engineering Building

The departments of Chemical Engineering, Civil Engineering, Mechanical Engineering and Electrical Engineering comprise the School of Engineering. Each department offers a curriculum leading to a Bachelor of Science degree in that particular branch. A curriculum in Industrial Engineering is offered in the Mechanical Engineering department. All curricula are accredited by the Engineers Council for Professional Development.

Engineering can be defined as the combination of science and art by which materials and power are made useful to mankind. An engineer requires intensive technical training but at the same time he should acquire the broad education that distinguishes the professional man from the technician. His education does not end with formal schooling but continues throughout his life as he accumulates experience.

The curricula in engineering have been carefully prepared to offer each student the opportunity to acquire the sound training in mathematics and the basic sciences of chemistry and physics upon which is built the work in the engineering sciences. In the senior year courses are offered which enable the student to use his previous training for engineering analysis, design and engineering systems in his particular field of interest. About twenty per cent of his time is devoted to studies in the social science and humanistic area. Some opportunity is provided to elect courses from both the technical and humanistic-social fields.

The curriculum of the freshman year is the same for all. Specialization to a limited extent begins in the sophomore year.

CHEMICAL ENGINEERING. Chemical Engineering is concerned with the development of manufacturing processes in which chemical or certain physical changes of materials are involved. These are resolved into a coordinated series of unit operations (physical changes) and unit processes (chemical changes). The work of the chemical engineer is primarily concerned with the design, construction, and operation of equipment and plants in which these are applied. Chemistry, physics, and mathematics are the underlying sciences of chemical engineering, and economics is its guide in practice.

Chemical engineers are employed not only in industry manufacturing chemicals but in many others, such as petroleum refining, coal processing, refractories and clay products, cement, waste treatment, pulp and paper, rayon and textiles, paint and varnish, natural and synthetic rubber, foods, leather, plastics, soap, penicillin and other antibiotics. Much of the work of the atomic energy program is chemical engineering. The types of work done by chemical engineers include: design, construction, research, development, production, financial and patent appraisal, management, and sales.

Above, the Main Engineering Building. Below, classroom demonstration in electrical engineering.

CIVIL ENGINEERING. Civil engineering is concerned with structures, transportation, movement of fluids, use and storage of water, sanitation, and surveying and mapping. A civil engineer may be engaged in research, in planning and designing, in construction, or in maintenance and operation.

The curriculum gives a thorough training in the fundamental physical sciences and at the same time prepares a student for work in any branch of civil engineering, allowing him to specialize to some extent in whatever branch is most interesting to him—sanitation, mechanics and structures, hydraulics, foundation engineering, highway engineering.

ELECTRICAL ENGINEERING. Electrical engineering deals with the engineering applications of electricity. Because of its unusual amount of diversity, it is usually convenient to separate it into such main divisions as power, communications, electronics and control, and others.

The undergraduate curriculum is designed to prepare the student for work in any of these fields and to serve as a basis for further specialization. Courses in liberal arts and in engineering courses outside of the department give the student an understanding of the broader aspects of engineering and other fields.

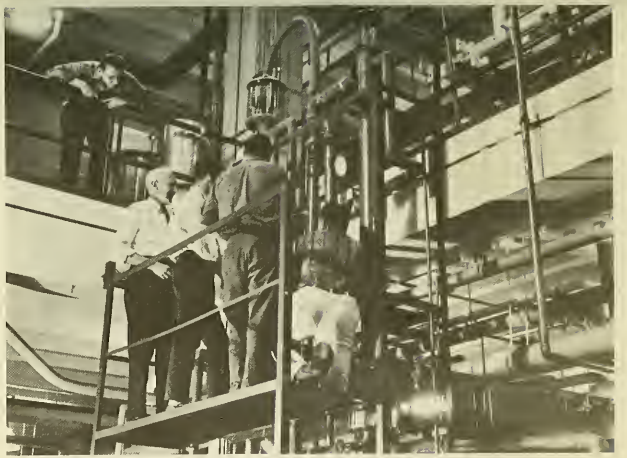
MECHANICAL ENGINEERING. Mechanical engineering is that branch of the profession which, broadly speaking, covers the fields of heat, power, design of machinery, industrial management and manufacturing problems.

Building upon a foundation of mathematics, physics, and chemistry, the department of mechanical engineering undertakes to show the student how fundamental physical laws apply to this field and to give him thorough training in the basic principles so that particular application can be mastered in professional practice. Therefore, no attempt is made to give highly specialized instruction.

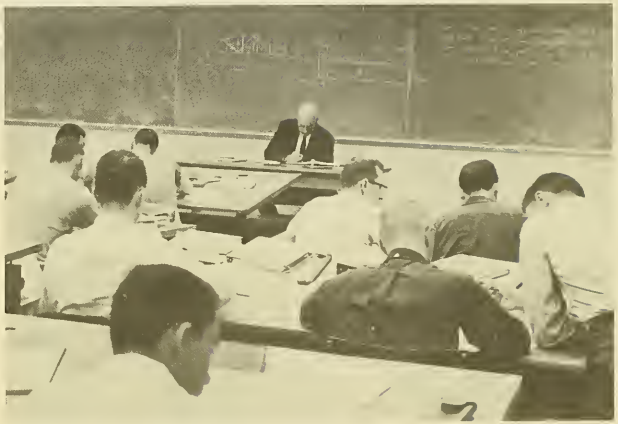
INDUSTRIAL ENGINEERING. Industrial engineering is concerned with the engineering aspects of the organization, operation and management of manufacturing plants. Consequently, the industrial engineering curriculum is built on a foundation of mechanical engineering. To the technical knowledge and scientific attitude developed through the study of engineering is added the study of certain courses in the humanities, in economics, and in management.

ENGINEERING SCIENCE OPTION. Engineering science is concerned with the application of the basic sciences to research and development in the engineering field. As such the curriculum contains extensive mathematics, physics, and other courses in the basic sciences designed to develop the student's skill in precise physical reasoning, analysis and synthesis. The student may elect the option from one of the four major departments at the end of his sophomore year provided he has completed his freshman and sophomore years with a quality point average of 2.80 or above or has achieved a cumulative average of 3.20 for the two preceding semesters.

The freshman year is the same for all students and the sophomore year corresponds to that major department in which the student is enrolled.

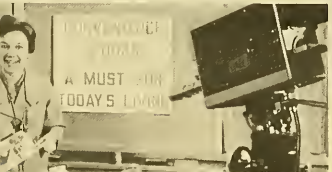


Studying techniques in chemical engineering.



Class in structural design in the School of Engineering.

SCHOOL OF HOME ECONOMICS



Marion A. Niederpruem, *Dean*
Skinner Hall

Home Economics encompasses areas of study which apply the principles and concepts of fundamental arts and sciences to the physiological, psychological, social and economic environmental needs of man.

The School of Home Economics has five subject matter areas (departments), namely: Food and Nutrition (FN); Textiles, Clothing and Environmental Arts (TCEA); Management and Family Economics (MFE); Human Development (HD); and Home Economics Education (HEEd.). The letters in parenthesis are area codes. Within these five areas the following undergraduate majors are offered:

DIETETICS AND INSTITUTIONAL ADMINISTRATION

FOODS IN BUSINESS

FASHION MERCHANDISING

HOME MANAGEMENT (Sept. 1965)

CHILD DEVELOPMENT

SECONDARY EDUCATION AND EXTENSION

The undergraduate program of the School, leading to a Bachelor of Science degree, emphasizes a liberal education in the sciences, arts and humanities with specialized instruction as preparation for professional careers. The transitional continuing relationships between liberal and professional education seek to develop in the student a disciplined mind, mental curiosity and professional competence.

Professional home economists are college and university graduates with bachelor degrees in Home Economics. They serve individuals, families, and communities through schools and colleges, extension programs, business organizations of many kinds all over the world, community and government organizations and agencies, newspapers, magazines, radio and television. Representative types of activities that Home Economists participate in include teaching, research, writing, dietetics, extension work, interior decoration, fashion merchandising, food consulting, food service management and product development. Experience and advanced study in areas of specialization lead to positions of great responsibility.

Food and Nutrition

Food and Nutrition curricula provide courses in Food and Nutrition combined with a strong foundation in the Arts and Sciences with two majors: Dietetics and Institutional Administration; and Foods in Business.

Above, Skinner Hall, which houses School of Home Economics. Below, left, students learn to use television to extend food and nutrition information to consumers; learning experience for student majoring in nursery school education. On right, students in fashion merchandising prepare for careers in business.

DIETETICS AND INSTITUTIONAL ADMINISTRATION. This curriculum prepares the student for positions as therapeutic and administrative dietitians; teaching and research dietitians and nutritionists with public and private agencies. An increasing number of new opportunities continually challenge graduates in this major.

The sequence offers opportunities for further work at the graduate level. This program is planned to meet the basic requirements of the American Dietetic Association for admission to approved dietetic internships.

FOODS IN BUSINESS. This curriculum is based on professional training in Food and Nutrition combined with other selected courses in Home Economics, the humanities, Western cultures, social sciences and business. The program is designed for the student who is oriented to the business world, and leads directly into development and promotion with food, equipment and utility industries. Positions are open in the field of communications for the student who combines her knowledge of Food, Nutrition and Equipment with Journalism, English, Speech, Television and Radio. Graduates with a major in this sequence are also placed in advertising and public relations agencies or with a consulting firm. This curriculum allows students to pursue graduate study.

Textiles, Clothing and Environmental Arts

FASHION MERCHANDISING. The retailing and professional opportunities associated with clothing, textiles, home furnishings and related merchandise are limitless. They include positions with manufacturers, producers, retailers, buying organizations, newspapers and magazines, radio and TV and consumer groups, as well as educational institutions and social and government agencies. The student who is interested in the business field pursues, by specializing in this area, a curriculum with a strong program of liberal arts emphasizing the social sciences. Courses which build on this foundation providing professional business competency include fundamentals of clothing, textiles, fashion and environmental arts as well as courses in business, retailing and related subjects. Those students who are particularly interested in Interior Design may follow a slightly different sequence of courses.

Management and Family Economics

The area of Management and Family Economics is concerned with achievement of goals and mediation of values within the family. Decision-making and organizing processes are studied as the means to these ends. The field is concerned with the family as an economic unit and social system. Sociology, Economics, Anthropology and Philosophy provide support for the field.

HOME MANAGEMENT. The undergraduate specialization in this area is planned for September 1965. The curriculum provides breadth in Home Economics and depth in the Social Sciences. It will prepare students for positions as home economists in private and governmental agencies concerned with family education and welfare here and abroad. It meets the requirements for Civil Service positions. In addition, the curriculum provides the foundation for graduate work.

Field experience with agencies serving families will be provided to aid the student in gaining competence in implementing programs related to family education and welfare.

Human Development

The area of Human Development is of necessity interdisciplinary in nature. The program brings together knowledge from Psychology, Sociology, Anatomy, Physiology, Nutrition, Education, the Arts, Anthropology, and relates it to Human Development and early childhood education. It is concerned with all maturational and environmental effects upon developing individuals, and with all theoretical and empirical descriptions of how this development occurs.

CHILD DEVELOPMENT. The child development program prepares the student for work in various types of group programs serving preschool-aged children, such as laboratory, public, and private nursery schools, clinics for exceptional children, hospital recreation programs, and community and welfare agencies. In addition, the child development curriculum provides a good background for graduate work in various other child serving professions.

Directed experience with the children of the laboratory nursery school and their families provides the necessary opportunity for students to develop a sound personal philosophy of early childhood education, and to achieve competence in implementing it. More intensive specialization for qualified students may be obtained by the election of a one-semester affiliation with: (1) Merrill-Palmer Institute in Detroit, Michigan, which specializes in the study of human development and family life; (2) the Eliot-Pearson School in Boston, Massachusetts, which specializes in the education of the three- to six-year-old child.

Home Economics Education

Home Economics Education offers a curriculum which provides a broad cultural education and preparation for teaching in secondary schools and the Cooperative Extension Service.

SECONDARY EDUCATION AND EXTENSION. The School of Home Economics, in cooperation with the School of Education, prepares students for teaching home economics in junior and senior high schools. This curriculum serves also as a base for graduate study in subject matter areas in home economics and home economics education. Students interested in the Cooperative Extension Service will, with the assistance of an extension adviser, select courses in preparation for continuing education positions in adult and 4-H programs.

SCHOOL OF NURSING

Mary A. Maher, *Dean*
School of Nursing
Western Massachusetts
Public Health Center

The basic nursing curriculum is designed as a four-year academic program to prepare the qualified high school graduate for a career in professional nursing, as well as for the responsibilities of family and community life.

The program aims to equip the graduate with those understandings and skills which are needed to function effectively in beginning positions in a variety of nursing situations. These include the ability to provide competent nursing care to patients and families in the hospital, home and community; to participate with allied professional and citizen groups for the improvement of total health services to individuals and communities; to participate in organizing, planning and directing the work of nursing auxiliary workers. A foundation is laid for advanced study, through which the nurse may prepare for positions in teaching, supervision, administration, consultation and research.

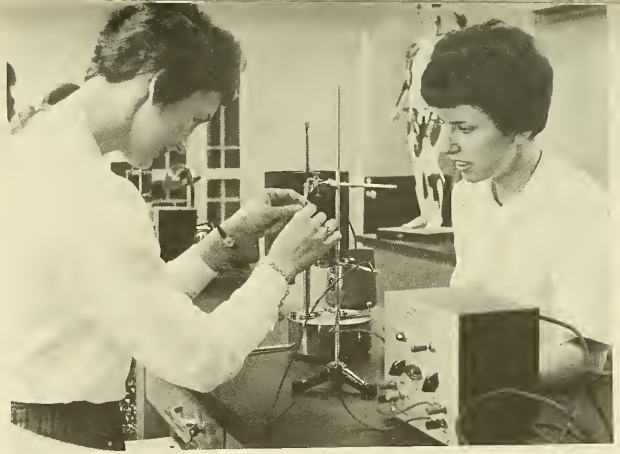
During the first two years the students build a firm educational foundation upon which to base the more specialized portion of the program. Courses in the humanities and in the sciences—biological, physical and behavioral—are taken with other students on the campus.

The clinical aspects of the program are developed beginning with the second year. Instruction and correlated clinical practice are given in selected co-operating agencies by the nursing faculty of the University and the allied professional staffs of the cooperating agencies. These agencies include: the Springfield Hospital; the Wesson Maternity Hospital, and the Wesson Memorial Hospital, Springfield; the Northampton State Hospital; the Day Care Center of the Springfield Adult Mental Health Clinic; the Visiting Nurse Association of Springfield, the Springfield Health Department; and other community health, educational and welfare resources.

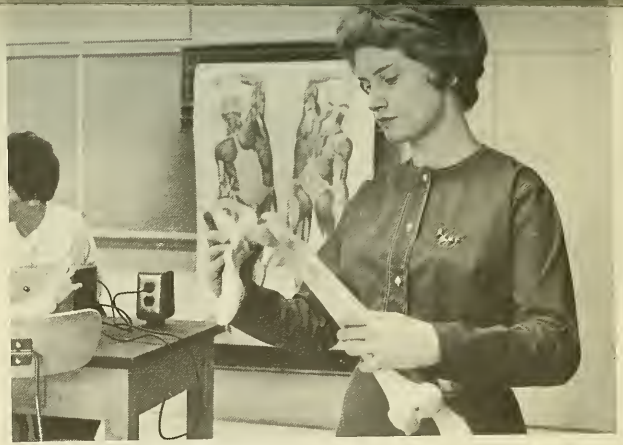
The Bachelor of Science degree, awarded upon successful completion of this program, qualifies the graduate for State Board Examinations in Nursing. If achievement in these examinations is satisfactory, the candidate receives legal status as a registered nurse within the state.

The program is approved by the Massachusetts Board of Registration in Nursing and accredited by the Accrediting Service of the National League for Nursing.

Above, the Western Massachusetts Public Health Center, home of the School of Nursing. Below, Students involved in study session in hospital library. Uniform is one designed especially for University nursing students.



Tools for learning: a laboratary in School af Nursing.



The essential background—knawledge af anatamy and physiology . . .

Clinical study in the children's ward af a hospital.

Today a student—tomarrow, a professianal in her field.

SCHOOL OF

PHYSICAL EDUCATION

Warren P. McGuirk, *Dean*
Frank L. Boyden Physical Education Building

The School of Physical Education includes the Departments of Physical Education for Men, Physical Education for Women, Recreation, and Athletics. It offers undergraduate majors in Physical Education and in Recreation and a graduate degree in Physical Education.

Physical Education for Men

GENERAL PROGRAM. Each male freshman and sophomore student, unless exempted under certain conditions, must successfully complete four semesters of physical education and demonstrate his ability to swim as a requirement for his degree. The physical education requirement does not apply to those students excused by the University physician, veterans of more than six months of military service, and certain transfer students.

Students may receive credit for physical education, during the sport in season by becoming squad members of any freshman or varsity team. Freshmen who elect an athletic team sport for physical education credit must rejoin their class sections at the termination of the seasonal sport. Students may not participate in a given sport for credit for more than two semesters.

MAJOR PROGRAM. The major program leading to the degree of Bachelor of Science in physical education is designed to train the student for a career as a teacher of physical education. The curriculum combines both general and professional education and provides for full teacher certification for the student who has met the prescribed requirements of preparation. The program also provides for adequate training in a minor area of teaching, elected by the student, including the coaching of inter-school athletics.

Physical Education for Women

GENERAL PROGRAM. Physical Education is required of all women students during their freshman and sophomore years. The courses are planned to provide recreative activity, to improve individual skills, to develop body grace and efficiency and to increase health and vigor.

The first and second year women students are required to take three class hours a week for a total of eight credits, one for each quarter of satisfactory work.

Above, the Frank L. Boyden Physical Education Building.
Below, the Women's Physical Education Building.

MAJOR PROGRAM. The major course in physical education is planned to prepare women students for professional careers. Special attention is given to preparing teachers for elementary and secondary schools in both physical and health education. Other areas for which the graduate will qualify are teaching sports and dance in social agencies, industrial plants, civic centers and camps. A foundation will be laid for specialization in graduate study. The curriculum gives a broad general background as well as the professional preparation.

Recreation

MAJOR PROGRAM. The department seeks to prepare men and women for positions involving administrative, supervisory and program leadership responsibilities in municipal recreation agencies, voluntary and youth-serving agencies, hospitals, and industrial and institutional organizations.

The program is designed to provide opportunities for a general education, a knowledge and understanding of people and society, activity skills and resource knowledge, professional competency, and practical experience in various leadership situations.

In addition to completing the curriculum as described below, the student is required to:

(1) attend a professional conference approved by the department;

(2) participate in programming activities at the Student Union, with a scout troop, or in a similar setting approved by the department;

(3) devote one summer (minimum of six weeks) to a recreation position, preferably with pay, in a camp, playground, or similar setting approved by the department.

Department of Athletics

(W. P. McGuirk, *Director;* E. E. Lorden, *Assistant Director.*) The following men coach intercollegiate athletics and intramurals: R. E. Bergquist, freshman coach of baseball and Stockbridge basketball; R. L. Bresciani, Assistant Director of Sports Information; L. E. Briggs, coach of varsity soccer; M. G. Brosky, freshman coach of wrestling; J. L. Cabb, freshman coach of track; J. J. Delaney, assistant coach of football; J. G. Douglas, coach of wrestling; W. Footrick, coach of track and cross country; Capt. R. Fowler, coach of rifle; V. H. Fusia, coach of football; R. F. Garber, coach of lacrosse; C. S. Gladchuk, director of intramurals and coach of golf; F. J. Glatz, assistant coach of football; J. Gundersheim, coach of freshman gymnastics; G. Karras, assistant football coach; V. A. Keedy, physiotherapist; E. K. M. Kjeldsen, varsity coach of gymnastics; S. R. Kosakowski, director of Stockbridge athletics and coach of hockey and tennis; J. A. Leaman, Jr., freshman coach of basketball and soccer; E. E. Lorden, coach of baseball; Capt. W. McGinnis, coach of pistol; W. P. MacConnell, coach of ski; Col. J. C. Marchant, coach of Stockbridge rifle; R. W. O'Connell, financial manager of athletics; J. M. Orr, coach of basketball; R. H. Page, director of sports information; J. R. Rogers, Jr., coach of swimming; T. S. Schmitt, assistant football coach; R. W. Gage, M.D., team physician and medical advisor.

TO KEEP AMERICA PHYSICALLY FIT—A few of the activities associated with the major areas in the School of Physical Education.

DEPARTMENT OF PUBLIC HEALTH

Robert W. Gage, Chairman

The Department of Public Health offers undergraduate instruction in the area of environmental health, public health administration, and medical technology. It also offers a graduate program leading to the degree of Master of Science in Environmental Health.

PUBLIC HEALTH. Public health practice is offering an increasing variety of significant career opportunities in many areas. Among these are the following: (1) administration of community health services; (2) general or specialized direction of environmental health services; (3) work and research in the basic sciences related to health; (4) work in the food and drug protective services; (5) involvement in health education, and (6) participation in programs of health information and communication. It is the intent of the Department of Public Health to provide, within the University's framework of presenting a liberal education to all its students, a basis for competence and skill in at least one of these areas. In addition, the program is intended to provide a solid comprehensive foundation upon which subsequent specialized or graduate study can be continued in any of the major areas of public health.

MEDICAL TECHNOLOGY. The curriculum in medical technology is recommended for young men and women in preparation for a wide variety of occupational opportunities. Medical technology graduates may be prepared for positions in medical laboratories, in federal, state, and local health departments, and in commercial and research laboratories. In this area there are two possibilities for arrangement of the curriculum. Students may complete the full four years of undergraduate instruction and, after receiving their baccalaureate degree, enter a 12-month internship in an approved hospital laboratory. At the end of this (fifth) year of preparation, the student will be eligible for examination by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology.

An optional three-and-one program is now offered which allows the student to obtain the baccalaureate degree and complete the requirements for examination for registration in a total of four years. In this program the student is able to complete the University's core requirements and complete the preparation for the clinical laboratory training within three years. The fourth year of study is taken in one of the hospitals affiliating with this department and approved for clinical laboratory training. Academic credit is allowed for participation in this program so that by the end of four years, a student will have gained a total of 120 credits, which is sufficient for graduation.

DIVISION OF MILITARY AND AIR SCIENCE

The Division of Military and Air Science includes the Department of Military Science and the Department of Air Science. No major is offered in either department. Effective academic year 1963—1964, the ROTC (Army and Air Force) program is voluntary. Male students who are physically qualified may register in the two-year basic ROTC course and receive credit toward graduation. Completion of the basic course is a requirement for enrollment in the advanced course which leads to a commission in the armed forces.

DEPARTMENT OF MILITARY SCIENCE (Army)

Albert W. Aykroyd, Colonel, U. S. Army, Head

The Army Reserve Officers Training Corps is the means by which young men who have taken the leadership step of coming to the state university may assure themselves that their military service is performed in commissioned status. The first two years are basic training in leadership and citizenship. The student is informed on the position of the military in the current scene and as it relates to his future. The second two years of ROTC are not only elective, but selective. The best qualified students are selected and are permitted to contract to continue on to a commission. The Army provides these men a subsistence allowance and additional emoluments. There is a six-week summer camp training period between the junior and senior year. Participation in ROTC has notable effect in character development. It also discloses to the Army existing officer material and its potential leaders. Successful completion of this program leads to a commission as a Second Lieutenant, U. S. Army. Active duty requirements are, at the present time, two years service with an active Army unit.

DEPARTMENT OF AIR SCIENCE

Roy D. Simmons, Lt. Colonel, USAF, Head

The mission of the Department of Air Science is to develop in select students those qualities of leadership and other attributes essential to their progressive advancement to positions of increasing responsibility as commissioned officers. It is not expected that all students commissioned will select the United States Air Force as a career; however, the program provides excellent preparation for such a career. Further, even though an Air Force career is not selected, the experience gained and the leadership qualities developed will enhance professional and managerial opportunities in the business society.

The program is presented in two phases; the Freshman and Sophomore years are designated as the Basic Course, and the Junior and Senior years as the Advanced Course.

The first two years of the program are not obligatory and are designed primarily to educate the student to the point where he can make a more intelligent decision concerning his military obligation and whether a tour of active duty as a commissioned officer corresponds with his career objectives.

COURSE REQUIREMENTS IN THE FRESHMAN YEAR

The following listings are designed to give prospective students a complete schedule of the courses required in the freshman year in all colleges and schools of the University.

Note: Courses in Military and Air Science, although listed among the programs below, are elective offerings and are not required for graduation.

COLLEGE OF ARTS AND SCIENCES

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3*	2	Speech 3*	2
Mathematics or Natural Science[1]	3	Mathematics or Natural Science[1]	3
Natural Science or History 5[2]	3	Natural Science or History 6[2]	3
Foreign Language[3]	3	Foreign Language[3]	3
Elective[4]	3	Elective[4]	3
Military or Air Science 1 (men)	1	Military or Air Science 2 (men)	1
Physical Education 1, 2 (men)**	2	Physical Education 3, 4 (men)**	2
Physical Education 5, 7 (women)**	2	Physical Education 6, 8 (women)**	2

[1]Candidates for the B.S. degree take Mathematics. Those planning to major in chemistry or physics should, if possible, elect Mathematics 5 and 6.

[2]Candidates for the B.S. degree take natural science; candidates for the B.A. degree take History 5 and 6.

[3]Subject to exemption on basis of proficiency examination.

[4]Candidates for the B.S. degree take science.

*May be taken either semester.

**Not quality point credit.

COLLEGE OF AGRICULTURE

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3*	2	Speech 3*	2
Mathematics	3	Mathematics	3
Chemistry 1	3	Chemistry 2	3
Botany 1	3	Zoology 1	3
Military or Air Science 1 (men)	1	Elective[2]	3
Food Economics 1	2	Military or Air Science 2 (men)	1
Physical Education 1, 2 (men)**	2	Physical Education 3, 4 (men)**	2
Physical Education 5, 7 (women)**	2	Physical Education 6, 8 (women)**	2

[1]Elective may be any freshman or sophomore course—most will elect Animal Husbandry 2, Horticulture 2, Entomology 26 or Forestry 26. A foreign language may be substituted for the Food Economics-elective sequence.

*May be taken either semester or during a later year.

**Not quality point credit.

Freshmen majoring in Agricultural Engineering take the program listed under the School of Engineering. Freshmen majoring in Landscape Architecture will take Government 25 in place of Zoology 1, Art 33 in place of Food Economics 1, and Sociology in place of Chemistry 2.

SCHOOL OF BUSINESS ADMINISTRATION

In each subject a one year sequence is required.

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3*	2	Speech 3*	2
Mathematics	3-4	Mathematics	3-4
Hist. 5, 25, or Govt. 25	3	Hist. 6, 26, or Govt. 26	3
Science: elect one	3	Science: elect one	3
Chemistry 1		Chemistry 2	
Physics 3		Physics 4	
Botany 1		Botany 25	
Geology 1		Geology 2	
Zoology 1		Zoology 25 or 35	
Elective	3	Elective	3
Military or Air Science 1	1	Military or Air Science 2	1
Physical Ed. 1, 2 (men)**	2	Physical Ed. 3, 4 (men)**	2
Physical Ed. 5, 7 (women)**	2	Physical Ed. 6, 8 (women)**	2

*May be taken either semester.

**Not quality point credit.

SCHOOL OF EDUCATION

1st Semester	Credits	2nd Semester	Credits
English 1	2	English 2	2
Speech 3*	2	Speech 3*	2
Math. 1 or Chem. 1	3	Math. 2 or Chem. 2	3
Zool. 1 or Bot. 1	3	Bot. 1 or Zool. 1	3
Foreign Lang.**	3	Foreign Lang.**	3
History 5	3	History 6	3
Education 9†		Education 9†	
Military or Air Science 1 (men)	1	Military or Air Science 2 (men)	1
Physical Ed. 1, 2 (men)‡	2	Physical Ed. 3, 4 (men)‡	2
Physical Ed. 5, 7 (women)‡	2	Physical Ed. 6, 8 (women)‡	2

*May be taken either semester.
**Intermediate Proficiency Required.
†To be completed in a school year.
‡Not quality point credit.

SCHOOL OF ENGINEERING

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Math. 6, Calculus	3
Math. 5, Anal. Geom. and Calc.	3	Chem. 2 or 4, General*	3 or 4
Chem. 1 or 3, General*	3 or 4	Engineering 4, Engrg. Probs.	2
Engineering 3, Graphics	3	Physics 5	3
Social Sci. Elective	3	Social Sci. Elective	3
Military or Air Science 1**	1	Military or Air Science 2**	1
Physical Ed. 1, 2†	2	Physical Ed. 3, 4†	2

*It is recommended that Chemical Engineering majors take Chemistry 3 and 4 in place of Chemistry 1 and 2.
**Military and Air Science are optional.
†Not quality point credit.

SCHOOL OF HOME ECONOMICS

Key: FN—Food and Nutrition
TCRA—Textiles, Clothing and Related Arts

MAJOR IN DIETETIC AND INSTITUTIONAL ADMINISTRATION

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 2, Composition	2
Speech 3*	2	Chemistry 2, General	3
Chemistry 1, General	3	Psychology 1, General	3
FN 27, Man and Nutrition	3	Mathematics 1, Introduction	3
Foreign Language or Humanities Elective	3	Zoology 1, Introduction	3
Sociology 25, Introductory	3	Physical Education 6, 8†	2
Physical Education 5, 7†	2		

*May be taken either semester.
If a foreign language is elected, student must complete the intermediate year.
†Not quality point credit.

SCHOOL OF HOME ECONOMICS (Continued)

MAJOR IN FOOD AND NUTRITION IN BUSINESS

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 2, Composition	2
Speech 3, Communications	2	Psychology 1, General	3
Chemistry 1, General	3	Chemistry 2, General	3
FN 27, Man and Nutrition	3	Zoology 1, Introductory	3
Sociology 25, Introductory	3	TCRA 23, Art for Living	3
Elective	3	Elective	3
Physical Education 5, 7†	2	Physical Education 6, 8†	2

†Not quality point credit.

MAJOR IN FASHION IN RETAILING AND BUSINESS

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 2, Composition	2
Speech 3, Communication	2	Science, Physical or Biological	3
Science, Physical or Biological	3	Psychology, 1	3
Sociology 25	3	Language	3
Language	3	TCRA 24, Textiles I	3
TCRA 23, Art for Living	3	Physical Education 6, 8†	2
Physical Education 5, 7†	2		

†Not quality point credit.

MAJOR IN SECONDARY EDUCATION AND EXTENSION

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 1, Composition	2
Speech 3, Oral Communication	2	Psychology 1, General	3
Chemistry 1, General	3	Chemistry 2, General	3
FN 27, Man and Nutrition	3	Mathematics 1, Introductory	3
Sociology 25, Introductory	3	TCRA 24, Textiles I	3
Government 25	3	Physical Education 6, 8†	2
Physical Education 5, 7†	2		

†Not quality point credit.

MAJOR IN NURSERY SCHOOL EDUCATION

1st Semester	Credits	2nd Semester	Credits
English 1, Composition	2	English 2, Composition	2
Zoology 1, Introductory	3	Economics 25, Elements of	3
Foreign Language	3	Foreign Language	3
FN 27, Man and Nutrition	3	Sociology 25, Introductory	3
Psychology 1 or 5, General	3	Elective	3
Speech 3, Oral Communication	2	Physical Education 6 and 8†	2
Physical Education 5 and 7†	2		

†Not quality point credit.

SCHOOL OF NURSING

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Chemistry 1	3	Chemistry 2	3
Soc. 25 or Psych. 1	3	Soc. 25 or Psych. 1	3
Zoology 1	3	Nursing 1	3
Social Science Elective	3	Social Science Elective	3
Speech 3**	2	Speech 3**	2
Physical Ed. 1a, b	2	Physical Ed. 6 and 8	2

**May be taken either semester.

SCHOOL OF PHYSICAL EDUCATION

PHYSICAL EDUCATION FOR MEN

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
P. E. 23, Principles of Health Ed.	3	Speech 3	2
Statistics 21	3	Social Science Elective	3
P. E. 21, Intro. to Phys. Ed.	3	P. E. 22, First Aid and Safety	3
P. E. 5, Skills and Techniques (Lacrosse—Gymnastics)	1	P. E. 6, Skills and Techniques (Gymnastics—Badminton)	1
Elect One		*Elect One*	
Chemistry 1	3	Chemistry 2	3
Botany 1	3	Botany 1	3
Zoology 1	3	Zoology 1	3

PHYSICAL EDUCATION FOR WOMEN

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Zoology 1, Introductory	3
Hist. 5, Mod. Europ. Civ.	3	Hist. 6, Mod. Europ. Civ.	3
W. P. E. 1, Intro. to P. E.	2	W. P. E. 2, Intro. to Chld. thru P. E.	2
Statistics 21	3	W. P. E. 10, Health for Adults	2
W. P. E. 11, Skills	1	W. P. E. 12, Skills	1
Elective*	3	Elective*	3

*Chemistry 1 and 2 are required if students have not had chemistry in high school. Others may select from Chemistry, Physics, Microbiology, or foreign language.

RECREATION

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3	2	Statistics 21	3
Bot. 1, Intro. Bot.	3	Zool. 1, Intro. Zool.	3
Govt. 25, American Govt.	3	Soc. 25, Intro. to Soc.	3
Humanities Elective	3	M. P. E. 22, First Aid & Safety	3
Rec. 1, Intro. to Rec.	3	Rec. 2, Social Rec.	2
P. Rec. 13, Skills & Tech.	1	P. Rec. 14, Skills & Tech.	1

DEPARTMENT OF PUBLIC HEALTH

PUBLIC HEALTH

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1	2	English 2	2
Speech 3, I or II*	2	Speech 3, I or II*	2
Mathematics 1 or 9**	3	Mathematics 2 or 10**	3
Chemistry 1	3	Chemistry 2	3
Zoology 1	3	Zoology 35 or Elective	3
Psychology 1 or Sociology 1	3	Psychology 1 or Sociology 1	3
Phys. Ed. 1a, b	2	Phys. Ed. 2a, b	2

MEDICAL TECHNOLOGY

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 1, Composition	2	English 2, Composition	2
Speech 3, I or II*	2	Speech 3, I or II*	2
Chemistry 1, General	3	Chemistry 2, General	3
Botany 1 or Zoology 1	3	Botany 1 or Zoology 1	3
Foreign Language***	3	Foreign Language***	3
Mathematics 1, Intro.	3	Mathematics 2, Intro.	3
Phys. Ed. 1a, b	2	Phys. Ed. 2a, b	2

*May be taken either semester.

**On basis of placement tests and interest in advanced science.

***If a language is elected, intermediate proficiency is required.

DEPARTMENT OF MILITARY SCIENCE (ARMOR)

1st Semester	*Credit*	*2nd Semester*	*Credit*
M. S. 11	1	M. S. 12	1

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Air Science 11 (AFOE 111) Foundations of Aerospace Power I	1	Air Science 12 (AFOE 112) Foundations of Aerospace Power II	1

and

One of the following which may be completed in either semester:

	Credits
English 1 or 3	3
Speech 3	2
Psychology 1 or 5	3

WHERE TO WRITE FOR FURTHER INFORMATION

Academic Affairs
Oswald Tippo, *Provost*

Admissions
William D. Tunis, *Dean of Admissions*

Expenses, Payments
Kenneth W. Johnson, *Treasurer*

Health Services
Dr. Robert W. Gage

Housing
John C. Wells, *Director of Housing*

Men's Affairs
Robert S. Hopkins, *Dean of Men*

Placement and Financial Aid Services
(Loans and Scholarships)
Robert J. Morrissey, *Director*

Records and Transcripts
William Starkweather, *Associate Registrar*

Stockbridge School of Agriculture
Fred P. Jeffrey, *Director*

Student Affairs
William F. Field, *Dean of Students*

Summer Sessions
Office of the Provost

Women's Affairs
Helen Curtis, *Dean of Women*

All correspondence should be addressed to the appropriate office, University of Massachusetts, Amherst, Massachusetts.

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Graduate School

University of Massachusetts Bulletin 1965-1966

Volume LVI November, 1964 Number V

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GRADUATE SCHOOL

UNIVERSITY OF MASSACHUSETTS

Catalog for 1965-1966

UNIVERSITY OF MASSACHUSETTS

Amherst, Massachusetts

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ACADEMIC CALENDAR 1964-1965

September 8, 1964, Tuesday — *Graduate pre-registration day for new students.*

September 14, Monday — *Registration of graduate students.*

September 15, Tuesday — *Classes begin.*

September 28, Monday — *Last date to add courses.*

October 1, Thursday — *Last day on which Ph.D. candidates who plan to complete their work by the June 1965 Commencement may take the preliminary comprehensive examination.*

October 12, Monday — *Columbus Day; a holiday.*

October 28, Monday — *Last date to drop courses.*

November 11, Wednesday — *Veterans' Day a holiday.*

November 25, Wednesday, after last class to November 30, Monday, 8:00 A.M. — *Thanksgiving recess.*

December 8, Tuesday — *Counseling day for students in residence.*

December 19, Saturday, after last class to January 4, Monday, 8:00 A.M. — *Christmas recess.*

January 4, 1965, Monday — *Last day on which thesis outlines may be handed in by Master's degree candidates who plan to finish their work by the 1965 Commencement.*

January 13, Wednesday — *Last day of classes.*

January 15, Wednesday, through January 23, Saturday — *Final examinations.*

January 23, Saturday — *Graduate Foreign Language Tests*

January 26, Tuesday — *Graduate pre-registration day for new students.*

February 2, Tuesday — *Registration.*

February 3, Wednesday — *Classes begin.*

February 16, Tuesday — *Last date to add courses.*

February 19, Friday, after last class to February 23, Tuesday, 8:00 A.M. — *Washington's birthday holiday.*

March 16, Tuesday — *Last date to drop courses.*

April 10, Saturday, after last class to April 20, Tuesday, 8:00 A.M. — *Spring recess.*

April 10, Saturday — *Graduate Foreign Language Tests*

May 11, Tuesday — *Counseling Day, no classes.*

May 25, Tuesday — *Last day of classes.*

May 27, Thursday, through June 5, Saturday — *Final examinations.*

May 28, Friday — *Last day for bound theses to be handed in.*

June 10, Friday, through June 12, Sunday — *Commencement.*

August 7, Saturday — *Graduate Foreign Language Tests*

ACADEMIC CALENDAR 1965-1966

September 2, 1965, Thursday — *Graduate pre-registration day for new students.*

September 9, Thursday — *Registration for graduate students.*

September 10, Friday — *Classes begin.*

September 23, Thursday — *Last date to add courses.*

October 1, Friday — *Last day on which Ph.D. candidates who plan to complete their work by the June 1966 Commencement may take the preliminary comprehensive examination.*

October 12, Tuesday — *Columbus Day; a holiday.*

October 21, Thursday — *Last date to drop courses.*

November 11, Thursday — *Veteran's Day; a holiday.*

November 24, Wednesday, after last class to November 29, Monday, 8:00 A.M. — *Thanksgiving recess.*

December 1, Wednesday — *Counseling Day for students in residence.*

December 18, Saturday, after last class to Monday, January 3, 8:00 A.M. — *Christmas recess.*

January 3, 1966, Monday — *Last day on which thesis outlines may be handed in by Master's degree candidates who plan to finish their work by the 1966 Commencement.*

January 8, Saturday — *Last day of classes.*

January 12, Wednesday, through January 20, Thursday — *Final examinations.*

January 22, Saturday — *Graduate Foreign Language Tests*

January 24, Monday — *Graduate pre-registration day for new students.*

January 31, Monday — *Registration.*

February 1, Tuesday — *Classes begin.*

February 14, Monday — *Last date to add courses.*

February 22, Tuesday — *Washington's Birthday; a holiday.*

March 14, Monday — *Last date to drop courses.*

April 2, Saturday, after last class to April 11, Monday — *Spring Recess.*

April 16, Saturday — *Graduate Foreign Language Tests*

April 19, Tuesday — *Patriot's Day; a holiday.*

May 4, Wednesday — *Counseling Day, no classes.*

May 24, Tuesday — *Last day of classes.*

May 26, Thursday through June 4, Saturday — *Final examinations.*

May 27, Friday — *Last day for bound theses to be handed in.*

May 30, Monday — *Memorial Day; a holiday.*

June 10, Friday through June 12, Sunday — *Commencement.*

August 6, Saturday — *Graduate Foreign Language Tests*

TRUSTEES of the UNIVERSITY

Organization of 1964

Members of the Board	*Term Expires*
J. John Fox of Boston	1965
Miss Victoria Schuck of South Hadley	1965
Dennis Michael Crowley of Boston	1966
Martin Sweig of Winthrop	1966
Frank Learoyd Boyden of Deerfield	1967
George L. Pumphret of Dorchester	1967
Harry Dunlap Brown of North Chatham	1968
John William Haigis, Jr. of Greenfield	1968
Most Reverend Christopher Joseph Weldon of Springfield	1969
Fred C. Emerson of Agawam	1969
Edmund J. Croce of Worcester	1969
Calvin H. Plimpton of Amherst	1969
Hugh Thompson of Milton	1969
Joseph P. Healey of Arlington	1970
Frederick Sherman Troy of Boston	1970
Robert D. Gordon of Lincoln	1971
Louis Martin Lyons of Cambridge	1971

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Alfred L. Frechette, *Commissioner of Public Health.*
Owen B. Kiernan, *Commissioner of Education.*
Charles Henry McNamara, *Commissioner of Agriculture.*
Harry C. Solomon, *Commissioner, Department of Mental Health.*

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*GERARD BRAUNTHAL, *Associate Professor of Government*[2]

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*PHILLIPS R. JONES, *Associate Professor of Physics*

*ROBERT C. JONES, *Assistant Professor of Education*

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*WILLIAM J. MELLEN, *Research Professor of Animal Science*

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*ALEX PAGE, *Associate Professor of English*

ALBERT W. PURVIS, *Dean of the School of Education*

*G. DALE SHECKELS, *Head of the Department of Electrical Engineering*

KENNETH W. SHERK, *Director of Graduate Study, Smith College*

*J. HAROLD SMITH, *Professor of Chemistry*

ARLESS A. SPIELMAN, *Dean of the College of Agriculture and Director of the Experiment Station and the Extension Service*

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1 Representing Dean Warren McGuirk, Physical Education

2 Substituting for Professor Alex Page on leave 1964-65

3 Substituting for Professor Phillips R. Jones on leave the second semester of 1964-65

* Elected by the Graduate Faculty

GENERAL INFORMATION

The University

The University of Massachusetts is the state university of the Commonwealth. It was founded in 1863 under the provisions of the Morrill Land-Grant Act passed by the United States Congress one year earlier.

Situated in one of the most picturesque sections of the state, the University joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges—in maintaining the rich tradition of educational and cultural activity associated with this Connecticut Valley region. The University's central campus consists of approximately 1000 acres of land and 100 buildings. Physical growth has been carefully planned, with provisions for additional buildings and facilities to accommodate an enrollment of approximately 20,000 students by 1975.

The Dean of the Graduate School in collaboration with the University Graduate Council exercises over-all review and supervision of graduate programs conducted in the several colleges and provides guidance in the development of new programs as well as the maintenance of standards for existing programs. Each college of the University has developed its graduate programs in accord with the highest national professional standards of the respective fields.

COLLEGES OFFERING GRADUATE PROGRAMS

Seven colleges and schools of the University and one unaffiliated department are authorized to offer graduate degrees:

College of Arts and Sciences

College of Agriculture

School of Business Administration

School of Education

School of Engineering

School of Home Economics

School of Physical Education

Department of Public Health

Application Procedures For Admission and Readmission

ADMISSION

Graduates of this University having the bachelor's degree or of other institutions having substantially the same requirements for the bachelor's degree are eligible to apply for admission to a program of graduate studies. Application blanks may be obtained by writing to the Admissions Office, Graduate School, University of Massachusetts, Amherst, Massachusetts.

Application for admission with supporting documents should be received prior to the first enrollment. An applicant should request registrars of colleges previously attended to send transcripts directly to the Graduate School. This should be done early enough so that the transcripts as well as the completed application form for admission will be received at least one month prior to enrollment of the applicant. If a student is also applying for a graduate assistantship or fellowship his application materials for admission to the University should be received several months earlier.

READMISSION

Any student previously enrolled in graduate study at the University of Massachusetts who has not been in attendance for one or more terms should secure an application form from the Graduate Office and apply for readmission. At least three weeks prior to the first day of registration of the semester in which the student expects to resume his studies, this form should be completed and sent to the Graduate School with an official transcript of any work taken while not enrolled at the University of Massachusetts. Any graduate student enrolled in the University during a spring semester may attend the following summer and/or fall semester without filing for readmission.

FOREIGN STUDENT ADMISSION

The prospective foreign student will be required to have a working command of the English language. Students will not be admitted who are deficient in this respect.

ADMISSION OF FACULTY MEMBERS TO GRADUATE STUDY

A member of the faculty of The University of Massachusetts with the rank of assistant professor or higher may not earn a graduate degree from the University of Massachusetts. He may, however, do graduate work on a non-degree basis. A full-time staff member of the University of Massachusetts may not carry more work in residence than an average of four credits per semester.

REQUIREMENTS FOR ADMISSION:

1. The applicant must have an undergraduate grade point average of 2.5 or better.

2. A Bachelor's degree or the equivalent from any college or university of recognized standing. Applications for admission from all graduates of non-

accredited schools in the United States must be supported by the results of an objective test such as the Graduate Record Examination or the Miller Analogies Test.

3. Two official transcripts of all previous college work.

4. Two letters of recommendation from persons in the field of the applicant's academic major at the institution most recently attended. Applicants whose academic references would go back more than five years may substitute other references if desired.

5. Acceptance by the department and by the Admissions Committee of the Graduate Council.

Admission to the Graduate School does not imply admission to candidacy for an advanced degree. Such candidacy is subject to specific requirements as laid down by the several departments. The student must secure the approval of the Head of the Department in which he desires to major before he can become a candidate for a degree in that subject.

Applicants will be admitted to the Graduate School in one of the following three categories:

Regular: a student admitted to full status in the graduate program of an academic department.

Special: a student admitted provisionally on a probationary status. At the conclusion of a semester of work—or two semesters if the department wishes—the student is either admitted to regular status or refused admission. If he is admitted to regular status, credits earned while in a special status are acceptable toward his degree if approved by his Guidance Committee.

Unclassified: a student who is not working toward a degree at this institution. Unclassified students do not have advisors. They apply for admission on a separate admission form.

Tuition and Fees

Tuition for residents of Massachusetts is charged at the rate of $10 per credit hour up to a maximum $100 per semester. Non-residents are charged $15 per credit hour up to a maximum of $150 per semester. In order to take advantage of the lower tuition rate, a student must have on file a Certificate of Residence properly authenticated by his Town or City Clerk.

OTHER FEES

1. Any student taking more than two courses shall be required to pay all the following fees:

Student Union	$10 per semester
Health Fee	$20 per semester
Identification card	$ 1 per year
Blue Cross/Blue Shield	$16 per year (optional)

2. Any student enrolled for fewer than three courses and living in University housing shall pay the Identification Card and the Health Fee.
3. Any student enrolled for less than three courses and not living in University housing shall pay the Identification Card fee only.

ADMISSION FEE

New students make an advance payment of $15.00 within thirty days of the time that they are notified that they are accepted for admission. This will be considered as first payment on University tuition and fees. It is not refundable and will be considered as payment for admissions and registration expense if the student does not enter the Graduate School.

Checks should be made out to the Treasurer of the University of Massachusetts and mailed to the Dean of the Graduate School.

PRE-REGISTRATION

Any student who does not report for pre-registration on the dates specified or fails to complete his pre-registration may be required to pay a late registration fee of $5.00. Admission is not assured for students who fail to pre-register. All students who are pre-registered are required to report on Registration Day only for purposes of signing a certification of registration form.

WAIVER OF TUITION AND FEES

Holders of certain titles are exempt from tuition and certain fees. Waiver forms must be processed before registration in order to take advantage of waivers.

Candidates for a Master's degree who have paid a full year's tuition in the Graduate School are not required to pay tuition if they later register only for a Master's thesis.

Candidates for the Doctor of Philosophy degree who have paid two full years' tuition in the Graduate School are not required to pay tuition if they later register only for the Doctor's thesis.

BOARD

Graduate students may purchase meal tickets and eat at any line in either the North Commons Dining Room or the South Commons Dining Room.

Meal tickets are available at the following rates:

	One Semester	Two Semesters
5 day (15 meals Monday thru Friday)	$185	$370
7 day (21 meals Monday thru Sunday)	$224	$448

Graduate students may also buy individual meals on a cash basis.

Assistantships and Fellowships

UNIVERSITY GRADUATE FELLOWSHIPS

These fellowships are unrestricted and are awarded on a University-wide basis by competition. They are intended to encourage and assist superior students in pursuing graduate study and in completing the requirements for graduate degrees in the minimum possible time.

A recipient of one of these awards must enroll as a full-time student. He is not required to give formal service to the University or to the department in which he is enrolled.

The stipend is $2,500 for the academic year. The fellowships are not renewable beyond the third year. They are payable in ten monthly installments from September through June, and carry a waiver of tuition and fees.

Application forms may be obtained by writing to the Graduate Office of the University of Massachusetts. Completed applications must be submitted before March 1 for the following September. Awards are announced by April 15. Applicants not currently enrolled in graduate study at the University should also have on file an application for admission to the Graduate School.

GRADUATE ASSISTANTS

The University offers a number of graduate assistantships for the purpose of assisting with the instructional and research programs of various departments. The stipend varies, up to a maximum of $2,500 for the academic year, depending upon the qualifications of the applicant. Graduate assistants are not required to pay tuition if their stipend is $1,250 or higher. Such assistants may carry up to thirteen credits per semester, but the total for both semesters of any one academic year may not exceed twenty-four credits. Application should be made to the Head of the Academic department.

RESEARCH ASSISTANTSHIPS

A number of research assistantships are available to qualified graduate students. These are made possible because funds are provided by (a) various industries. (b) the Experiment Station, or (c) research grants awarded to members of the Graduate Faculty either from sources outside the University or from a fund provided by the University and administered by the Research Council. Stipends vary with the type of work and the amount of time involved. Interested students should make application to the Head of the Department in which they plan to work.

LOTTA CRABTREE FELLOWSHIPS

A limited number of fellowships paying $3,000 each are available to students in the broad field of agriculture. Students applying for these fellowships must be interested in earning the Doctor of Philosophy degree for the purpose of serving agricultural pursuits. Application should be made to the Dean of the Graduate School.

THE CRAMPTON RESEARCH FUND

Interest from the Guy Chester Crampton Research Fund is used to help defray the costs of publication of worthy research papers completed by students or occasionally by staff members. Information concerning the fields of work for which grants may be made, and instructions for application, may be obtained from Department Heads, the chairman of the Crampton Fund Committee or the Graduate School office.

Programs Offered

Courses available as major subjects for the Degree of Doctor of Philosophy:

Agronomy
Animal Science
Botany
Chemistry
Chemical Engineering
Civil Engineering
Economics
English
Entomology
Food Science and Technology
French
Geology
German
Government
History
Microbiology
Philosophy
Physics
Plant Pathology
Psychology
Sociology
Spanish
Zoology

Courses available as major subjects for the degree of Doctor of Education:

School Administration
School Guidance

Courses available as major subjects for a Master's degree:

Accounting
Agricultural and Food Economics
Agricultural Engineering
Agronomy
Animal Science
Botany
Business Administration
Chemical Engineering
Chemistry
Civil Engineering
Dramatic Arts
Economics
Education
Electrical Engineering
English
Entomology
Finance
Fine Arts
Food Science and Technology
Forestry and Wood Technology
Geology
German-Russian
Government
History
Home Economics
Horticulture
Industrial Engineering
Landscape Architecture
Mathematics
Mechanical Engineering
Microbiology
Philosophy
Physical Education
Physics
Plant and Soil Sciences
Plant Pathology
Psychology
Public Health
Romance Languages
Sociology and Anthropology
Speech
Statistics
Wildlife and Fisheries Biology
Zoology

CERTIFICATE OF ADVANCED GRADUATE STUDY

The School of Education conducts several programs leading to the Certificate of Advanced Graduate Study. These are not degree programs. These programs call for a minimum of sixty semester hours of graduate work beyond the Bachelor's degree, of which at least thirty must be taken at the University of Massachusetts and of these at least fifteen must be taken in the School of Education. Of all the course work leading to the Certificate at least eighteen credits must be 700-900 (200) courses. No credit is valid after ten years and the last 30 credits must be taken within a four year period.

All fees and expenses must be paid before the Certificate will be conferred.

Requirements for Doctoral Degrees

All requirements for the several advanced degrees must be completed by May 28, if the degree is to be received at the Commencement following that date. (September 1 for students planning to receive their degrees in the winter.)

DOCTOR OF PHILOSOPHY

In order to provide proper direction for the Ph.D. candidate, a Guidance Committee of three will be appointed not later than two months after his first registration. This Committee will be appointed from members of the Graduate Faculty recommended by the Department Head of the student's major department, and will consist of two members of the major department and one other person.

This Guidance Committee shall meet with the candidate as soon as possible after the appointment has been made. At least three weeks prior to the candidate's second registration the Committee shall file in the Graduate Office a summary of the proposed program of the student, including specific courses recommended by the Committee. In addition to this original meeting with the student, the Guidance Committee's responsibilities shall be to:

a. Approve the program of the student.
b. Arrange for the preliminary comprehensive examination of the student.
c. Approve the procedure for the satisfying of the language requirements by the student.
d. Supervise the dissertation project and arrange for the final examination. The Guidance Committee will serve as the Dissertation Committee for the Ph.D. candidate.
e. Report the fulfillment of all requirements to the head of the major department, the vote of the Committee to be unanimous on this.

The degree is conferred upon graduate students who have met the following requirements:

1. The preparation of a dissertation satisfactory to the Guidance Committee and the major department.

2. The successful completion of graduate courses in the major field. The Guidance Committee will determine the number of graduate credits which the student must earn.

3. The passing of a preliminary comprehensive examination to be conducted by the major department, to be passed not later than eight months before the completion of the candidate's work. This examination may not be taken until after the language requirements have been met (see number 4 below).

If the student fails the comprehensive examination he may, at the discretion of the Guidance Committee, be permitted a second and final opportunity.

4. The satisfactory completion of the following language requirements: two languages foreign to the candidate at least one of which must be a European language other than English. Proficiency tests should be passed as early as possible and must be passed prior to the preliminary examination. In lieu of

one of the above foreign languages, graduate students may, upon the recommendation of their Guidance Committees, present themselves for a Tool of Research examination. If the student passes this examination, he will be required to pass only one foreign language examination. In special cases where, in the opinion of the Guidance Committee, a knowledge of two foreign languages is not likely to be greatly useful to the student, the student may substitute six hours of graduate cognate work for one of the languages. In such cases the level of proficiency for the remaining language will be increased to require functional use of it, including a reading, writing, speaking and listening knowledge of it.

5. The passing of a final examination, at least partly oral, conducted by the Guidance Committee primarily upon, but not limited to, the contents of the candidate's dissertation. The examination cannot be scheduled until all members of the Committee have approved the dissertation. The oral examination is to be conducted by the Committee. The Examining Committee is to consist of the Dissertation Committee and such members of the major department as the head shall appoint. In order to pass, the candidate must receive the unanimous vote of the Dissertation Committee. Not more than one dissenting vote shall be allowed for the total Examining Committee present.

6. The satisfactory completion of the residence requirement: The equivalent of at least one academic year of full-time graduate work must be spent at the University of Massachusetts. A minimum of three years beyond the bachelor's degree is required. Credits for each graduate course become invalid nine years following the date of completion of the course except that graduate credits previously earned at another institution which have been accepted by the graduate Council for full credit toward the requirements of the Ph.D. degree shall become invalid nine years from the date of first registration in the Ph.D. program.

7. The payment of all fees and expenses.

DOCTOR OF EDUCATION

The School of Education offers several specialized programs leading to the Doctor of Education degree for those employed in the educational field. The requirements for this degree follow closely those outlined for the Doctor of Philosophy degree except that in place of the foreign language requirement the candidate may demonstrate a mastery of fundamental statistics and computer language and operation. Residency must be met by two consecutive semesters on campus. Prospective candidates should contact the Admissions Committee of the School of Education before starting formal application for admission.

FOUR-COLLEGE COOPERATIVE Ph.D. DEGREE

A cooperative Ph.D. program has been established by Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts. The degree is awarded by the University of Massachusetts but some and perhaps much and in a few exceptional cases even all of the work leading to the degree might be done in one or more of the other institutions.

When a student has been awarded a degree under this program, the fact that it is a cooperative Ph.D. degree involving Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts will be indicated on the diploma, the permanent record card and all transcripts, as well as on the Commencement Program.

The requirements for the degree are similar to those for the Ph.D. degree at the University of Massachusetts except for the statement relating to "residence." For the cooperative Ph.D. degree "residence" is defined as the institution where the thesis work is being done.

When this catalog went to press, the following Departments were authorized to offer the Cooperative Ph.D. degree: all the Departments in the Biological Sciences; Chemistry, French, Geology, German, Philosophy, Physics, and Spanish.

Students interested in this program should write to the Dean of the Graduate School.

Graduate Reading Examination in Foreign Languages

1. The Graduate School participates in the Graduate Student Foreign Language Testing Program conducted on a nation-wide basis by the Educational Testing Service. The examinations are given on campus by the Guidance Office. They are given three times during the academic year. The dates are set nationally by the Educational Testing Service. Dates and information booklets concerning the tests may be obtained from the Guidance Office, Machmer Hall.

2. The level of language competence required by the tests is intended to be the same as would be needed to produce a usable translation of a professional article in one's own field of study.

3. Upon the recommendation of the Guidance Committee, a student who has completed two years of undergraduate work in a foreign language with a grade of B or better in the second year may be certified as having satisfied the reading requirement for the Ph.D. in that language without further examination. (This option is not available to students who elect to take only one language with the course work option as a substitute for the second one.)

4. A foreign student who wishes to offer English as a foreign language must also offer another European language, other than his native tongue. The "Tool of Research" options are not available to a student who offers English as one of his languages.

If a student offers English as a foreign language no special examination will be given. His competency in it will be certified by the head of the department in which he is majoring after he has completed one full semester in residence.

TOOL OF RESEARCH EXAMINATION

A tool of Research may be substituted for one foreign language requirement for the Ph.D. upon the recommendation of the student's Guidance Committee.

Two examinations in Tools of Research may be required for the Ed.D. degree.

1. The general standards for a Tool of Research are;

a. The tool shall have a clearly constructive relevance to the candidate's research field.

b. It shall replace neither a required nor a prerequisite element of the major field.

c. It must require more than the satisfactory completion of a course.

d. It must require a meaningful competence in the use of the tool.

e. Evaluation of the candidate's competence shall lie outside the Guidance Committee.

2. Tool of Research examinations are presently given in three fields:

a.) Statistics: The student must demonstrate an ability to deal with the symbols used in statistics. He must be familiar with the concepts of randomness, measures of central tendency and dispersion, tests of hypotheses,

confidence intervals, and relationships between variables. The student is expected to have a more detailed knowledge of one of the following fields: survey sampling, acceptance sampling, experimental design or multivariate analysis. The student must show a knowledge of the concepts and techniques that are commonly used in one of the above areas. Inquiries concerning the examination should be addressed to Professor Gail B. Oakland, Head of the Department of Statistics.

b.) Mathematics: (Not open to students in the physical sciences or mathematics.) Since the mathematical areas involved will vary greatly with each case, a committee will be appointed to draw up a list of topics for each applicant and to give the examination. The committee will consist of two members of the Department of Mathematics, one of whom will be Chairman of the Committee, and two persons from the student's major department. Inquiries may be addressed to Professor Wayman L. Strother, Head of the Department of Mathematics.

c.) Computer Language: The examination will be a written test of the student's ability to translate with mature comprehension between the following languages: English, machine language, compiler language. The particular machine language and compiler language for each examination is announced prior to the examination. Inquiries concerning the examination should be addressed to Professor J. A. N. Lee. Associate Professor of Computer Science.

Doctoral Dissertation

A dissertation must be on a topic in the field of the candidate's major subject, and must indicate that its writer possesses the ability and imagination necessary to do independent constructive thinking. The following rules should be adhered to in the preparation and presentation of a dissertation:

The objective should be to make a contribution to knowledge. When completed it should be of a quality worthy of publication as a contribution from the department concerned.

The dissertation in its completed form, will be judged largely upon the ability of the author to review literature and reach definite deductions; to formulate a problem, plan a method of attack, and work out a solution; and to summarize his material and draw conclusions. Scholastic attainment in writing and presenting the results of the study will also be an important factor in the evaluation.

1. The professor within the department who is responsible for the direction of the student's research will be appointed the chairman of the student's Dissertation Committee. Only members of the Graduate Faculty may be appointed to a committee.

2. It is the responsibility of the chairman of the Dissertation Committee to arrange a conference with other members of the committee and the student for the purpose of discussing the research problem before approving the dissertation outline. This should be done as soon as possible after the appointment of the committee.

3. A copy of the student's dissertation outline is then to be signed by each member of the committee to indicate approval of the outline and to indicate the fact that a conference with the student has been held. The signed copy is then to be sent to the Dean of the Graduate School.

4. The Committee will have direct charge of all matters pertaining to the dissertation. The dissertation must have the unanimous approval of this committee and the approval of the major department before arrangements are made for the final examination for the degree.

5. Suitable copies will be supplied to the Graduate School. An unbound original and one bound copy are required. The student is responsible for the binding of the dissertation.

6. Because of the time required to give adequate consideration to the research conducted by the student, it is highly desirable that the dissertation be submitted to the committee not later than March 15, and deposited with the Dean of the Graduate School by May 28.

7. It is desirable to secure as much uniformity of style in dissertations as is practicable. However, different disciplines have worked out widely accepted distinctive research styles which should be mastered by the student whose life work is to be in the discipline. The following recommendations are intended to achieve as much uniformity as is practicable:

a. *The University of Chicago Manual of Style* shall be the Graduate

School standard. However, any school, college or department may specify substitute standards agreed upon in that discipline.

b. The original of the Ph.D. dissertation is left unbound. The second (departmental) copy should be bound in black in a permanent waterproof buckram.

c. Lettering is required on the spine of bound dissertations. Lettering shall read down from the top in the following order: Author's last name, name of department, degree and year of degree. The name of the department may be abbreviated if necessary. No other lettering is necessary.

Example: Smith History Ph.D. 1963

d. Weight of the paper shall be 20 pound bond. Size shall be 8½ by 11 inches. Margin to the left shall be 1½ inches; margin to the right, 1 inch.

e. Any method of reproducing duplicate copies is acceptable that produces the required number of clear, neat, and permanent copies.

f. The form of doctoral dissertations must conform to the "Suggestions for the Preparation of Dissertations for Microfilming" which may be obtained from the Graduate Office.

g. *Form of title page.* The title page should be arranged in this order:
   a. Subject.
   b. Name of author.
   c. Degrees previously earned and names of institutions awarding them.
   d. "Thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of—."
   e. "University of Massachusetts, Amherst."
   f. Date.

h. Following the granting of the doctorate, the Graduate School will have the dissertation microfilmed. The dissertation must be put into condition for publication on microfilm with as much care as if it were to appear in printed form and must have the approval of the student's doctoral committee. The student should supply to the Graduate School an unbound original and one bound copy of his dissertation. He should also provide an abstract, in triplicate, of fewer than 600 words.

The microfilm fee of $35.00 covers microfilm publication of the dissertation by University Microfilms, Inc., and the publication of the abstract by them in *Dissertation Abstracts.* The microfilm fee also covers the cost of copyright in the author's name. The dissertation will be catalogued in the Library of Congress and in the University of Massachusetts Library. Microfilm copies may be purchased from University Microfims, Inc., Ann Arbor, Michigan.

Publication by microfilm does not preclude the printing of the dissertation in whole or in part in a journal or as a monograph.

Requirements for Master's Degrees

Master of Arts, Master of Fine Arts, Master of Science, Master of Science in Accounting, Master of Science in Finance, Master of Science in Agricultural Engineering, Master of Science in Chemical Engineering, Master of Science in Civil Engineering, Master of Science in Electrical Engineering, Master of Science in Industrial Engineering, and Master of Science in Mechanical Engineering.

The basic requirements for the above degrees are:

1. Thirty graduate credits, of which not more than six of grade B or better may be transferred from other institutions. Twenty-one of the thirty credits must be in the major field. If a thesis is offered, six credits must be earned in 700-900 (200) series courses; if a thesis is not offered, twelve credits must be earned in 700-900 (200) series courses. Not more than ten credits may be earned by means of a thesis. No credit is valid after six years.
2. The thesis is optional with the school or department, but if there is one, it shall be under the supervision of a committee recommended by the major department. The thesis must be approved by the Thesis Committee and by the major department. Thesis committees for candidates for the Master's degree will consist of one or more members of the Graduate Faculty at the discretion of the head of the department. The candidate must pass a general oral examination (not limited to the thesis topic) to be conducted by an examining committee of at least three members of the Graduate Faculty. This examination must be taken whether the student writes a thesis or not. The examination will cover the work of the student in preparing for the Master's degree. The recommendation of two of the three members of the examining committee shall be requisite to receiving the degree. If a student offers a thesis, problem courses shall be limited to six credits; if a thesis is not offered, the limit shall be nine credits.
3. Students who are candidates for the Ph.D. degree may apply for the Master's degree when they have fulfilled the residence and course requirements for the doctorate, have passed the language examinations, and have successfully completed preliminary comprehensive examinations for the Ph.D.
4. All foreign language requirements for the Master's degree are optional with the school or department.
5. All fees and expenses must be paid before the degree will be conferred.

Course credits used by any student for fulfilling the requirements for a Master's degree may not be used by the student for fulfilling the requirements for any other Master's degree at this University.

MASTER OF EDUCATION

The degree is conferred upon graduate students who have met the following requirements:

1. Thirty to thirty-four credits. If 30 credits are offered, no more than six may be transferred from other institutions; if 34 credits are offered, no more than nine credits may be transferred from other institutions.

Fifteen of the total credits must be in Education, and of those twelve credits must be earned in 700-900 (200) series courses. No credit is valid after six years. Work of less than B grade cannot be transferred.

2. The problem or practicum is optional but if it is not chosen the total credits must be thirty-four. Credits in workshop courses are limited to six. The student must pass a comprehensive written examination.
3. In order to receive the Master of Education degree the candidate must have a cumulative quality point average of 3.0 at the completion of the required minimum number of credits (or within six semester hours beyond the minimum) for the program in which the candidate is enrolled. Otherwise the School of Education will recommend to the Graduate Council that the candidate be dropped from the School of Education as a graduate student.
4. All fees and expenses must be paid before the degree will be conferred.

MASTER OF ARTS IN TEACHING

This is a cooperative program between the various Colleges and Schools of the University and the School of Education. The program for elementary and secondary school teaching is intended primarily for graduates of approved liberal arts institutions who have had little or no course work in professional education. The program for community college teaching is intended for graduates of approved liberal arts, engineering or business schools who have programs of concentration needed in community colleges. The student will register in the School of Education for one of the following programs:

1. *The Community College Program.* If the student has no professional education he will take Psychology 601 (156) and four other professional courses to be determined by his committee. He will take a minimum of twenty-four semester hours in his teaching field and of these at least twelve will be in advanced graduate courses. An internship of one semester is required.
2. *The Secondary School Program.* Eighteen credit hours in the fundamental professional courses usually required for certification; at least twelve credit hours in some field in Arts and Sciences in which the student has the necessary background. Of these twelve credit hours six must be in 700-900 (200) series courses.
3. *The Elementary School Program.* Twenty-four credit hours in the fundamental professional courses usually required for certification; at least twelve credit hours in some field in Arts and Sciences of which six must be in 700-900 (200) series courses.
4. In order to receive the Master of Arts in Teaching degree the candidate must have a cumulative quality point average of 3.0 at the completion of the required minimum number of credits (or within six semester hours beyond the minimum) for the program in which the candidate is enrolled. Otherwise the School of Education will recommend to the Graduate Council that the candidate be dropped from the School of Education as a graduate student.
5. All fees and expenses must be paid before the degree will be conferred.

MASTER OF BUSINESS ADMINISTRATION

1. Candidates for the degree of Master of Business Administration must satisfactorily complete thirty semester hours of approved graduate work providing such students have completed their undergraduate degree with a major in Business Administration.

2. For those students who have not presented the undergraduate degree in Business Administration the School shall determine what courses will constitute adequate preparation up to a maximum of thirty additional semester hours.

3. Permission to present a thesis may be granted to qualified candidates. For such students, an oral rather than a written general examination is required. The thesis proposal must be approved by the end of the first semester. Nine credit hours in lieu of course credit is allowed for a thesis.

4. Non-thesis candidates shall be required to pass a written comprehensive examination.

5. Applicants for admission are required to take the Admission Test for Graduate Study in Business given each year by the Educational Testing Service of Princeton, New Jersey. Applicants should apply to the Testing Service for further information.

6. Twenty-four credit hours of the thirty advanced credits required for the M.B.A. degree must be in courses designed exclusively for graduate students.

7. Graduate Assistants register for a maximum of 12 credit hours each semester rather than the 15 hours permitted other students. Generally, Graduate Assistants complete their courses during a summer session period following a spring semester.

8. All expenses and fees must be paid before the degree will be conferred.

MASTER OF SCIENCE IN ACCOUNTING AND IN FINANCE

The School of Business Administration offers graduate programs in Accounting and in Finance. This is in line with an established policy of the American Association of Collegiate Schools of Business of which this School is an accredited member. The Master of Business Administration degree is a general rather than a specialized degree.

MASTER OF FINE ARTS

This degree is particularly designed for those interested in the creative aspects of the arts. The degree may be obtained through the Department of Art for work in the visual arts, through the Department of English for work in creative writing, or through the Department of Speech for work in Dramatic Art.

The Basic Requirements for this Degree Are:

1. Sixty credits of which at least 54 must be at the graduate level. Not more than twelve credits may be transferred from other institutions. Twelve hours must be taken in one or more of the art fields other than that of the major department. No more than eighteen credits may be earned with the thesis project. No credit is valid after eight years.

2. The exact nature of the thesis project will be determined by the student's major professor in conference with the student. It is to be understood that the project will be productive of a work of art. A written analysis of the work itself and of the procedures used in producing it will be required. The candidate will be asked to pass an examination in his major field in addition to presenting his thesis project publicly.

The Master of Fine Arts Program is administered by an interdisciplinary committee appointed jointly by the Dean of the Graduate School and the Dean of the College of Arts and Sciences. Application for admission to the program should be made to the head of the department with which the student wishes to major.

MASTER OF LANDSCAPE ARCHITECTURE

The degree is conferred upon graduate students who have met the following requirements:

1. Work covering at least two years, of which a minimum of one and one-half years must be devoted to study in residence, and a minimum of one-half year spent in practice. Specific requirements concerning the nature of such practice are determined by the department.
2. Submission of a written report on the work done in practice, or an oral examination conducted by the department staff.
3. The earning of not fewer than forty-five credits of which thirty shall conform essentially to the "fifth year program" (see page 129) the remainder to be selected from the 700-900 (200) series on page 129, with minor deviations at the discretion of the department.
4. Preparation of a satisfactory thesis.
5. The passing of a final examination, written and oral.
6. All fees and expenses must be paid before the degree is conferred.

MASTER'S THESIS

The requirements for the master's thesis are the same as those for the doctoral dissertation listed above (p. 15) with the following changes:

1. A bound original and two bound copies of the thesis are required. One copy is returned to the major department for its files. All copies are bound in red, waterproof buckram.
2. Theses must be submitted to the committee not later than May 15 of the academic year in which the degree is to be conferred.
3. Microfilming is not required for master's theses.

General Regulations

1. Graduate credit will be allowed for grades A, B, and C. Not more than three credits of C will be allowed for a Master's degree. Not more than six credits of C will be allowed for the Doctor of Philosophy degree. Candidates registering for thesis credit (Thesis 800 (300) or 900 (400)) will register for credits in multiples of three or more each semester up to the total number of credits recommended by the Guidance Committee. Registration beyond that total will be for zero credits. Grades for thesis credit will be S or NS except for the semester in which the Thesis is completed when the grade will be either Pass or Fail as recommended by the Committee. No graduate credit will be given for courses numbered below 400.

2. Course numbering system at the University of Massachusetts:

001-099	Non-credit courses, non-quality point courses, entrance deficiencies, etc.
100-199 (1-49)	Undergraduate credit only: lower division.
200-399 (50-99)	Undergraduate credit only: upper division.
400-499 (100-149)	Professional courses which presume a bachelor's degree. No graduate degree credit.
500-699 (150-199)	Graduate credit only. Parallel to 200-399.
700-999 (200-400)	For graduate students only.
700 (200)	Special Problems
800 (300)	Master's Thesis
900 (400)	Doctoral Dissertation.

3. Withdrawal regulations:
   a.) To add, drop, or change a course, the student must obtain the written approval of the instructors concerned, his faculty advisor, and the Dean of the Graduate School. Signed cards are to be filed with the Graduate Office.
   b.) Within a period of ten academic days from the beginning of a semester a student who has satisfied the requirement of (a) above may add, drop, or substitute courses without penalty. No courses may be added beyond this date.
   c.) Within a period of six calendar weeks beyond the beginning of a semester a student may drop courses with a grade of W providing approval is obtained from the instructor and the student's major advisor. No courses may be dropped beyond this date except with a grade of WF unless special permission is obtained from the Dean of the Graduate School.

4. Incompletes:

A student can obtain credit for an "incomplete" only by finishing the work of the course before the end of the next semester (whether or not he is enrolled). The initiative in arranging for the removal of an "incomplete" rests with the student.

5. Attendance at commencement:

Attendance of Master's candidates at the June Commencement is desirable but not required. Attendance of Ph.D. candidates at the June Commencement is required unless excused by the Dean of the Graduate School.

6. Four-college library use:

The libraries at Amherst College, Smith College and Mt. Holyoke College are normally off-limits to graduate students from the University of Massachusetts. These library facilities are developed by these institutions to serve the needs of their own students. The physical facilities and staff services are not adequate to the additional loads imposed by outside demands.

Graduate students who have been accepted for candidacy and are working on doctoral dissertations may use these libraries by obtaining special permission from the Dean of the Graduate School. Such requests must be initiated through the Chairman of the Student's guidance committee.

Students enrolled in Four-College Cooperative Ph.D. programs may use the various libraries providing the head of the department concerned has supplied the name of the student to the appropriate librarians with a carbon copy to the Graduate Office.

Students taking courses on a campus other than their own are entitled to the use of the library on that campus for purposes of that course only.

Special Services Available To Graduate Students

HOUSING

Information about housing may be obtained by writing to the Director of Housing. The University does not provide housing for graduate students.

ATHLETIC TICKETS

Since graduate students are not charged an athletic fee, no reduced rates for individual game tickets are possible. However, full-time (more than six-credits) graduate students who are married may buy a pair of reserved seats for football for $12.00 and for basketball for an additional $12.00. Single graduate students may purchase season tickets for football and basketball for a total of $16.00.

GRADUATE COURSES DURING THE SUMMER

The University offers opportunities to pursue graduate courses during the summer in connection with the Summer School. Details regarding courses offered, facilities for study, etc., may be found in the Summer School Catalog, a copy of which is available upon request to the Provost of the University.

COUNSELING AND HEALTH SERVICES

The services of the Counseling Center are available to graduate students.

Complete health care, financed by the student health fee, is available without additional charge to *all* students. The Infirmary, furnishing both in-patient and out-patient care, is located immediately north of Brooks Dormitory.

Students will find services are most complete and readily available during regular out-patient hours:

Weekdays	8:00 a.m.— 5:00 p.m.
Saturdays	8:00 a.m.—12:00 noon

Emergency care is available at all times, day or night.

If you need to stay in the Infirmary, an attempt will be made to provide an opportunity for you to study if you feel able. Student visitors will be allowed during specific hours; parents may visit at any reasonable hour.

The resources of the Health Services are available to you so that illness and loss of valuable school time will be minimized. We should be able to help you before your needs are serious.

PLACEMENT AND FINANCIAL AID SERVICES

The services of the Placement and Financial Aid Offices are available to all degree candidates. Interest free, short term loans up to $100 are available.

HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Qualified scholars who may desire temporarily the privileges of the library and research facilities of the University, and who are not candidates for a degree may, upon recommendation of the Dean of the Graduate School and the approval of the President, be appointed Honorary Fellows without stipend.

DESCRIPTION of COURSES

Before consulting the course descriptions listed in this section, students should become thoroughly familiar with the General Regulations governing registration for courses in the Graduate School. The regulations (listed on Page 26) cover such matters as graduate credit, course numbering system, changing or dropping of courses, and requirements regarding incomplete work in a course. Students should also acquaint themselves with the requirements governing the particular degree for which they wish to take courses. These requirements are found under the appropriate degree headings beginning on Page 15.

AGRICULTURAL AND FOOD ECONOMICS

GRADUATE FACULTY

Head of Department
J. Blackmore

Professors
B. D. Crossmon
T. W. Leed

Associate Professors
S. Russell
D. A. Storey

Assistant Professors
J. H. Foster
E. Jarvesoo

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Problems in Agricultural Food and Resource Economics.
Investigations of problems in agricultural and food economics and firm management. *Credit, 3.* The Staff.

702 (202). Agriculture in the National Economy.
The application of economic theory, particularly macro-economics and welfare economics, to the determination of agricultural prices and income. The interdependency of agriculture and other sectors of the economy. Effects on agriculture of national, fiscal, and monetary policy. *Credit, 3.* The Staff.

704 (204). Advanced Food Marketing.
Market structure, prices, margins, efficiency, demand and supply analyses, theory of imperfect competition.
Prerequisite, Agricultural Economics 155 or permission of instructor.
Credit, 3. The Staff.

705 (205). Research Methods in Agricultural Food and Resource Economics.
Scientific method and its application. Selection, planning and conduct of research. Formulation of models and hypotheses. Interdisciplinary considerations. Techniques commonly used and promising new approaches. Evaluation of current research procedures. Research administration.
Credit, 1-3. The Staff.

721 (221). Natural Resource Development Economics.
Modern economic theory in relation to resource development, economic models for resource use planning, applications of recent innovations in economic analysis to problems of evaluation of resource development plans.
Credit, 3. The Staff.

740. Quantitative Methods.
Applications of micro-econometric techniques in agricultural, food and resource economics. Emphasis is put upon practical applications of modern methods of quantitative analysis to problems of the firm.
Credit, 3. The Staff.

775 (275). Advanced Agricultural and Food Economics.
An intensive study of the theory of the firm as it applies to agricultural and food production, including: production functions, cost functions, programming, and decision-making principles; the nature of the aggregate supply functions in agriculture; applications of these principles to the agricultural firm and regional resource allocation, and to the distribution of income to and within agriculture.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

799 (195). Seminar *Credit, 1-3.* Staff.

800 (300). Master's Thesis *Credit, 6.* Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

535 (175). Production Economics.
Application to farms and food production enterprises of economic principles governing production processes. Enterprise, firm and industry considerations. Methods of economic analysis.
Two class hours, one 2-hour laboratory period. *Credit, 3.* The Staff.

546 (176). Advanced Farm Management.
Applications of the theory of the firm and modern decision theory to management problems of typical farm firms. Plans for alternative farm adjustments will be analyzed using budgeting and other methods. *Credit, 3.* The Staff.

558 (158). Agricultural Policy.
Concepts of policy, economic foundations of policy problems, the policy-making process, and policy considerations for producers, consumers and taxpayers; foreign agricultural policy. *Credit, 3.* The Staff.

561 (155). Principles of Agricultural Marketing.
The economic principles governing the marketing of agricultural and food products; structure of agricultural markets. Monopoly and imperfect competition. Government in marketing. *Credit, 3.* Mr. Fitzpatrick.

565 (165). Food Merchandising.
The principles of merchandising food products. Effects of store layout, product location, product mix, methods of display, turnover, pricing, ordering, inventory control, upon sales and profits. *Credit, 3.* Mr. Marion.

568 (168). Food Distribution Economics.
A critical analysis of the food industry, factors affecting sales, costs, profits. Application of economic principles to financing, site selection, and store management. *Credit, 3.* Mr. Leed.

571 (171). Price Theory and Analysis.
Elements of food and agricultural price making; demand and supply theory and methods of price analysis and forecasting; introduction to econometrics. *Credit, 3.* The Staff

572 (172). International Policy in Agriculture.
The impact of forces such as economic development, population increases, and the decline of colonialism on world agriculture. World trade in agricultural products; the influence of national agricultural policies on trade; international agricultural agencies. *Credit, 3.* Mr. Foster.

580 (178). Resource and Conservation Economics.
Economic and institutional factors affecting land and water use. Land use planning, elements of conservation economics, recreation economics, water and watershed management. *Credit, 3.* Mr. Foster and Mr. Blackmore.

582. Water Quality Economics.
Principles for selection of welfare maximizing plans from among alternative pollution control policies and measures. Market and administrative decision making processes for pollution control. *Credit, 3.* The Staff.

AGRICULTURAL ENGINEERING

GRADUATE FACULTY

Head of Department
R. W. Kleis

Professor
J. T. Clayton
G. A. Fitzgerald

Associate Professors
J. S. Norton
J. W. Zahradnik
L. F. Whitney

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems. *Credit, 1-6.* The Staff.

761 (240). Advanced Agricultural Structures.
The application of structural theory in the development of high strength structures. The use of structural materials and fastenings for attaining diaphragms and prestressed components in the development of the structure. *Credit, 3.* Mr. Clayton.

766 (241). Control of Heat and Vapor Flow in Buildings and Processes.
Application of mass flow theory to heat and vapor trasfer. Thermal and vapor interchange between environment and livestock controlling production rates of metabolic heat and respiratory moisture. The application of instruments and controls.
Prerequisite, Mechanical Engineering 582 (182) or equivalent.
Credit, 3. Mr. Clayton.

776 (276). Advanced Agricultural Machinery Design.
Stress analyses, dynamic loading and the design of mechanisms of agricultural machines. Methods of analysis include finite difference, energy and graphical procedures as well as conventional machine design approaches. A complete design of a machine is required of each student.
Prerequisite, Mechanical Engineering 283 (83) or equivalent.
Credit, 3. Mr. Whitney.

781 (250). Agricultural Process Engineering.
A comparative engineering evaluation and analysis of agricultural product processes including: thermal processing, ionizing radiation processing, freeze drying, dehydration, fermentation and controlled atmospheres.
Credit, 3. Mr. Zahradnik.

786 (260). Advanced Process Engineering.
Dimensional analysis and reaction kinetics as applied to pilot plant procedures and the scale-up of biological processes for system design.
Prerequisite, Agricultural Engineering 781 (250). *Credit, 3.* Mr. Zahradnik.

791 (291). Seminar.
Research methods in Agricultural Engineering. *Credit, 1.* Mr. Kleis.

792 (292). Seminar.
Research accomplishments in Agricultural Engineering. *Credit, 1.* Mr. Kleis.

800 (300). Thesis Research — Master's Degree.
Credit, 4-8. The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

690 (190). Instrumentation.
The study of instruments as applied to scientific research: recorders, indicators, controllers and transducers in general. Emphasis on transducers for ten or twelve common variables including temperatures, pressure, humidity and strain. Particular attention to applications and limitations.
Prerequisite, Physics 107 (7) or equivalent. *Credit, 3.* Mr. Whitney.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Agricultural Engineering)

681 (181). Unit Operations in Food Engineering.
Study of the fundamental principles of unit operations and their application to food processing: including mixing, evaporation, distillation, dehydration, freeze drying, extraction and separation. *Credit, 3.* Mr. Fletcher.

686 (182). ELEMENTS OF PROCESS ENGINEERING.
Engineering concepts related to the processing of materials with emphasis on heat transfer, fluid flow, psychrometry, rheology, strength and associated instrumentation. *Credit, 3.* Mr. Fletcher.

ANIMAL SCIENCE

GRADUATE FACULTY

Head of Department
T. W. Fox

Professors
W. G. Black
R. A. Damon, Jr.
R. C. Foley
S. M. Gaunt
W. J. Mellen
E. F. Reber
J. R. Smyth

Associate Professors
D. L. Anderson
D. L. Black

Assistant Professors
H. Fenner
S. J. Lyford, Jr.

The graduate programs in the Animal Sciences include studies in mammalian and avian biology with options in (a) genetics, (b) physiology and (c) nutrition. Students planning to major in any one of these fields must have a strong background in biology and chemistry or mathematics, or must be prepared to remedy undergraduate deficiencies without graduate credit.

Requirements for both the M.S. and Ph.D. degrees include courses in the animal sciences offered by the department and courses in supporting areas offered by the departments of Zoology, Chemistry, Microbiology and Statistics. Available research material includes a number of domestic species.

COURSES OFFERED BY THE DEPARTMENT (Note: 500 series courses are open to both graduate and undergraduate students; 700 series are open to graduate students only. Where prerequisites are stated, equivalent courses taken at other institutions or permission of the instructor may be substituted.)

GENETICS

508 (An. Sci. 168). COMPARATIVE ANIMAL GENETICS.
The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation. Prerequisite, Zoology 540 (153). *Credit, 3.* Mr. Fox.

704 (Poultry Sci. 204). AVIAN GENETICS.
Lectures covering the classical and physiological genetics of morphological traits of avian species. Particular emphasis is given to melanogenesis and characteristics involving epidermal structures.
Prerequisites, one year's training in biology and Zoology 540 (153).
Credit, 3. Mr. Smyth.

705 (Poultry Sci. 205). GENETICS OF PRODUCTIVE TRAITS IN POULTRY.
Lectures and reports on the genetics of meat production and reproduction. Special emphasis is placed on the physiological genetics of fertility and embryogenesis.
Prerequisites, one year's training in biology and Zoology 540 (153).
Credit, 2. Mr. Smyth.

706 (Poultry Sci. 206). QUANTITATIVE INHERITANCE AND SELECTION.
The principles of population genetics and quantitative inheritance as applied to selection for traits of economic importance in poultry; theoretical and practical considerations of breeding systems.
Prerequisites, Animal Science 705 (205), or Zoology (540) 153—, Statistics 551 151. *Credit, 3.* Mr. Fox.

707 (An. Sci. 211). ADVANCED ANIMAL GENETICS.
Modern research in animal breeding with emphasis on the statistical approach. This includes the development of selection indexes for various farm animals, sire indexes, and breeding plans based on systems of mating and selection.
Prerequisite, Animal Science 508 (168). *Credit, 3.* Mr. Gaunt.

PHYSIOLOGY

520 (An. Sci. 150). ANIMAL PHYSIOLOGY.
A comparative study of the physiology of mammals and birds, with emphasis on those aspects most pertinent to animal science.
Prerequisite, Zoology 135 (35). *Credit, 4.* Mr. D. Black.

521 (An. Sci. 167). PHYSIOLOGY OF REPRODUCTION.
Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation. *Credit, 4.* Mr. W. Black.

724 (Poultry Sci. 207). ADVANCED AVIAN PHYSIOLOGY.
Lectures and reports on specific problems in avian physiology.
Prerequisites, Chemistry 520 (179), Animal Science 520 (150).
Credit, 3. Mr. Mellen.

725 (An. Sci. 215). MAMMALIAN REPRODUCTION.
An advanced course emphasizing the comparative approach to problems of reproductive anatomy and endocrinology. Lectures, laboratory and seminar reports with theoretical and practical considerations of current research findings in laboratory and domestic animals, and in primates.
Prerequisites, Zoology 535 (172) and 784 (187).
Credit, 3. Mr. D. L. Black.

726 (An. Sci. 216). FERTILITY AND FECUNDITY.
The role of heredity, nutrition, pathology and environment in the determination of fertility and fecundity in mammalian forms. Current research directed toward control of reproductive function through experimental means is emphasized.
Prerequisites, Animal Science 521 (167) and Zoology 668 (187) or Animal Science 725 (215). *Credit, 3.* Mr. W. G. Black.

NUTRITION

530 (An. Sci. 161). PRINCIPLES OF NUTRITION.
Scientific principles of nutrition, emphasizing the basic biochemical and physiological concepts underlying the specific functions and interrelationships of the nutrients required for maintenance, production, and reproduction in both ruminants and non-ruminants. *Credit, 3.* Mr. Anderson.

734 (Poultry Sci. 207). ADVANCED AVIAN NUTRITION.
Lectures, reports and discussions of significant research developments and theories in avian nutrition.
Prerequisites, Chemistry 561 (151), 562 (152) and 520 (179); and Animal Science 530 (161). *Credit, 3.* Mr. Anderson.

735 (An. Sci. 205). RUMINANT NUTRITION.
An advanced course in ruminant digestion and metabolism. Special topics will be selected and discussed in the light of recent and current research.
Prerequisites, Animal Science 530 (161), and Chemistry 520 (179).
Credit, 3. Mr. Lyford.

MISCELLANEOUS

700 (200). SPECIAL PROBLEMS.
A specific problem in some aspect of animal or avian science not related to the candidate's thesis. *Credit, 3-6.* The Staff.

751 (250), 752 (251). SEMINAR — REVIEW OF LITERATURE.
Credit, 1 each semester. The Staff.

800 (300). THESIS, MASTER'S DEGREE. *Credit, 10.*

900 (400). THESIS, PH.D. DEGREE.

ART

GRADUATE FACULTY

Head of Department
P. F. Norton

Associate Professors
W. Kamys
D. R. Matheson
L. N. Perkins

The degree of Master of Fine Arts is offered for those interested in the creative aspects of the arts. The degree may be obtained through the Department of Art for work in the visual arts, or through the Department of English for work in creative writing. Requirements for the degree are listed on page 24.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). SPECIAL PROBLEMS. *Credit, 3-12.*

800 (300). Master's Thesis. *Credit, up to 18.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Creative Art:

500 (151). Water Color.
Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein.
Six studio hours. *Credit, 3.*

502 (152). Water Color.
Continuation of Art 500.
Six studio hours. *Credit, 3.*

520 (153). Oil Painting.
Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition.
Six studio hours. *Credit, 3.*

522 (154). Oil Painting.
Continuation of Art 520.
Six studio hours. *Credit, 3.*

540 (157). Printmaking.
Basic study of materials, techniques, aesthetic considerations peculiar to graphic media of lithography and intaglio (etching, aquatint, etc.), permitting students to print their own work.
Six studio hours. *Credit, 3.*

542 (158). Printmaking.
Continuation of Art 540.
Six studio hours. *Credit, 3.*

560 (160). Sculpture.
Experimentation with materials. Investigation into the nature of 3-dimensional order. Individual projects.
Six studio hours. *Credit, 3.*

562 (161). Sculpture.
Continuation of Art 560.
Six studio hours. *Credit, 3.*

580 (165). Ceramics.
The designing and making of pottery with the potter's wheel and related tools. A student should have taken one or more basic courses in creative art before this course.
Six studio hours. *Credit, 3.*

582 (166). CERAMICS.
Continuation of Art 580.
Prerequisite, Art 580. Six studio hours. *Credit, 3.*

History of Art:

505 (171). ANCIENT ART AND ARCHAEOLOGY.
The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting. *Credit, 3.*

525 (173). MEDIAEVAL ART.
Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West. *Credit, 3.*

545 (175). RENAISSANCE ART.
Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory. *Credit, 3.*

565 (176). BAROQUE ART.
The art of the 17th and early 18th centuries in Italy, Spain, Germany, France and the Low Countries. *Credit, 3.*

585 (179). MODERN PAINTING AND SCULPTURE.
Origin of modern movements in art, and an analysis of contemporary techniques and styles as they relate to society. *Credit, 3.*

591 (181). MODERN ARCHITECTURE.
History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. *Credit, 3.*

595 (177). AMERICAN ART.
Study of the earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary phases of abstract art. *Credit, 3.*

675, 677 (195, 196). MASTERS OF WESTERN ART.
An intensive study of the work of a master in the field of art.
Prerequisite, permission of the instructor.
1 or 2 class hours. *Credit, 1-2.*

BOTANY

GRADUATE FACULTY

Head of Department
S. Shapiro

Professors
A. C. Gentile
R. B. Livingston
R. M. Schuster

BOTANY

Associate Professors
H. E. Bigelow
E. L. Davis
O. Stein

Assistant Professors
J. R. Rowley
R. T. Wilce

Instructor
M. E. Bigelow

Candidates for the Degree of Master of Arts and for the Degree of Doctor of Philosophy are accepted for admission under the general regulations of the Graduate School. Admission to advanced courses does not imply admission to candidacy for an advanced degree. Only students whose knowledge of botany and related chemical and physical sciences is considered by the Department to be adequate will be accepted as candidates for advanced degrees. Research work leading to the thesis may be selected from the fields of cytology, ecology, mycology, morphology, physiology, systematics, anatomy and histology.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems.
Research not expected to terminate in a thesis; advanced study in special subjects. *Credit, 1-5 each semester.* The Staff.

711, 712 (202, 203). Advanced Plant Physiology.
Selected topics in plant physiology.
Lectures, laboratory, and individual conferences.
Prerequisites, Botany 511 (167), 512 (168) and one semester of Organic Chemistry. *Credit, 2-4 each semester.* Mr. Gentile.

721 (207). Advanced Plant Ecology.
Lectures, conferences, critical reading and reports on advanced considerations of synecology and autecology.
Prerequisite, Botany 521 (181). *Credit, 3.* Mr. Livingston.

731 (209). Advanced Mycology.
Systematics and ecology of the higher ascomycetes and basidiomycetes; problems in growth and nutrition of fungi.
Prerequisite, Botany 531.
Credit, 3. Mr. H. E. Bigelow and Mrs. M. E. Bigelow.

741 (210). Advanced Phycology.
Detailed study of marine and fresh-water algae with emphasis on phylogeny, life histories and ecology.
Prerequisite, Botany 541 (161) or equivalent. *Credit, 3.* Mr. Wilce.

800 (300). Thesis, Master's Degree.

801 (206). Advanced Plant Morphogenesis.
Lectures, discussions and reading on the development of the plant body.
Prerequisites, Botany 591 (157) or 581 (159), Botany 511 (167) or equivalent. *Credit, 3.* Mr. Shapiro and Mr. Stein.

821 (214). Fossil Tracheophytes.
Detailed study of anatomy and reproductive histology of those fossil forms which best represent the phylogeny of vascular plants. *Credit, 3.* Mr. Putala.

825 (215). Palynology.
Development and comparative morphology of contemporary pollen grains and spores. Description and/or identification of modern and fossil pollen and spores with attendant laboratory and field techniques. Consideration is given to application of palynology in research, industry, and public health.
Credit, 3. Mr. Rowley.

850 (200). Seminar.
Credit, 1 each semester. Maximum credit, 6. The Staff.

900 (400). Thesis, Ph.D. Degree.
Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

511 (167). Introductory Plant Physiology.
Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration. *Credit, 4.* Mr. Gentile.
Prerequisite, 1 semester Organic Chemistry.

512 (168). Plant Metabolism.
A study of the chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants.
Prerequisite, Botany 511 (167). *Credit, 4.* Mr. Gentile.

515 (178). Plant Growth.
Internal and environmental factors influencing plant growth with emphasis on the role of hormonal regulation.
Prerequisite, Botany 511 (167). *Credit, 3.* Mr. Gentile.

521 (181). Plant Ecology.
Interrelationships between plants and their environment, with special emphasis on the structure and development of plant communities.
Credit, 3. Mr. Livingston.

522 (184). Autecology.
Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants.
Prerequisites, Botany 511 (167) and 521 (181). *Credit, 3.* Mr. Livingston.

526 (182). Plant Geography.
Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America.
Prerequisite, Botany 521 (181). *Credit, 3.* Mr. Livingston and Mr. Schuster.

531 (166). General Mycology.
Survey of the various fungi, their life history and distribution, their significance in disease, their utilization by man. *Credit, 3.* Mr. Bigelow.

541 (161). Phycology.
Designed to give insight into the phylogeny, taxonomy, morphology and ecology of the major groups of the marine and fresh water algae. To include field work in both marine and fresh water environments.
Credit, 3. Mr. Wilce.

551 (162). The Archegoniates.
The morphology, evolution and systematics of bryophytes, ferns and their allies.
Credit, 3. Mr. Schuster.

581 (159). The Angiosperms.
The evolution and systematics of flowering plants, emphasizing families and their relationships. *Credit, 3.* Mr. Schuster.

591 (157). Plant Anatomy and Histological Methods.
Study of origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies. *Credit, 4.* Mr. Putala and Mr. Shapiro.

601 (160). Morphogenesis.
Development of form and structure at the level of cellular differentiation.
Credit, 3. Mr. Davis and Mr. Shapiro

611 (189). Developmental Plant Cytology.
Emphasis on development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures.
Credit, 3. Mr. Rowley and Mr. Stein.

BUSINESS ADMINISTRATION

GRADUATE FACULTY

Dean
H. B. Kirshen

Assistant Dean
J. T. Conlon

Professors
J. W. Anderson
P. L. Cheng
H. E. Hardy
J. B. Ludtke
W. G. O'Donnell
F. A. Singer

Associate Professor
R. L. Rivers

The program of graduate courses in Business Administration is designed to prepare for positions of responsibility in business, in organizations that serve business, in government, and in related fields of teaching.

The School of Business Administration is an accredited member of the American Association of Collegiate Schools of Business.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

Courses B.A. 706 (230), B.A. 711 (211), B.A. 722 (222), B.A. 742 (242), B.A. 751 (251), B.A. 756 (207), and B.A. 799 (271) are required of all students who expect to receive the M.B.A. degree.

Courses Accounting 703 (203), Accounting 704 (204), Accounting 705 (205) and B.A. 799 (271) are required of all students who expect to receive the M.S. in Accounting degree. A minimum of 18 credit hours is required in "700" ("200") series courses.

M.B.A. COURSES

700 (200). Problems in Business Administration.
Independent study and research on selected problems in Business Administration. Permission of the instructor and the dean required.
Credit, 1-3 each semester. The Staff.

706 (230). Financial Management.
A case approach to business problems from the point of view of the financial manager. *Credit, 3.* Mr. Cheng and Mr. Ludtke.

707 (234). Micro Theory of Finance.
Study of optimum financial policies and decisions of non-financial firms. Theory of competition and optimum asset management of financial firms. Prerequisite, twelve hours in finance and economics. *Credit, 3.* Mr. Cheng.

711 (211). Accounting in Management.
The production and use of accounting and other quantitative data for decision-making related to planning and control.
Credit, 3. Mr. Lentilhon, Mr. Singer or Mr. Dennler.

716 (233). Financial Intermediaries and Markets.
Study of financial intermediaries and financial markets and the development of a theory of financial intermediation as it relates to growth, employment, and price levels. *Credit, 3.* Mr. Ludtke.

722 (222). Marketing Management.
The broad aspects of product planning and choice of channels of distribution; promotional problems; the interrelations between research, planning, execution and control of marketing activities. *Credit, 3.* Mr. Hardy.

742 (242). Organizing for Production.
Situations which confront executives in charge of manufacturing operations and the direction of people at work. Designed to develop skill in analyzing production processes and to determine specific adaptations of production and personnel techniques to the requirements of differing processes.
Credit, 3. Mr. Claunch.

751 (251). Principles and Policies of Administration.
An advanced course in the Theory of Business Administration, including the generic functions of management, organization theory, and systematic corporate decision making. *Credit, 3.* Mr. O'Donnell.

752 (252). Administrative Practices.
The application of principles of management to the analysis and the solution of actual integrative cases, with practice in policy formulation and managerial decision making. *Credit, 3.* Mr. O'Donnell.

756 (207). Quantitative Methods in Business Administration.
The application of symbolic logic, sets, probability theories (discrete) and Markov process to managerial decision-making in organization, marketing, personnel, production, transportation, finance, accounting and other functional areas. *Credit, 3.* Mr. Cheng, Mr. Ludtke or Mr. Theilman.

757 (208). Quantitative Methods in Business Administration.
The application of probability theory (discrete and continuous), stochastic process, linear, quadratic and dynamic programming, waiting lines, sequencing and computer simulation models to selected problems in management science. *Credit, 3.* Mr. Cheng or Mr. Ludtke.

799 (271). Seminar in Business Administration.
A critical and intensive study of selected problems in the field of business. *Credit, 3.* Mr. Kyler.

800 (300). Thesis, Master's Degree. *Credit, 9.*

M.S. IN ACCOUNTING COURSES

Accounting 701 (201). C.P.A. Preparation.
A study of areas covered in the uniform C.P.A. examinations with emphasis placed upon techniques of problem solving. Designed for those persons preparing to take the C.P.A. examination. *Credit, 3.* Mr. Lentilhon.

Accounting 702 (202). Accounting Systems.
A study of the problems involved in design, installation and operation of appropriate systems of accounts, records and reports for different types of business, and the preparation of flow charts procedures and control reports. *Credit, 3.* Mr. Krzystofik.

Accounting 703 (203). Accounting Theory.
The study of literature with agreed and controversial criteria for collecting and reporting financial information. *Credit, 3.* Mr. Singer.

Accounting 704 (204). Contemporary Accounting Issues.
Investigation and analysis of selected contemporary issues in accounting with presentation of individual findings through discussion and reports. *Credit, 3.* Mr. Mullins.

Accounting 705 (205). Seminar in Accounting.
Special problems of the Public Accounting profession, the history of Public Accounting, accounting organizations and publications. The course would stress written and oral communication and might include, for example, the preparation of an audit report. *Credit, 3.* The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Accounting

562 (162). ADVANCED ACCOUNTING.
A continuation of Accounting 261 (61), concerned with the valuation of assets and liabilities, accounting for net worth, statements of application of funds and the analysis of financial statements. *Credit, 3.* Mr. Fitzgerald.

564 (164). ADVANCED COST ACCOUNTING.
A continuation of the theory and practice of cost accounting with emphasis on standard, estimated, and distribution costs. *Credit, 3.* Mr. Lentilhon.

574 (174). C.P.A. PROBLEMS.
Extensive practice in solution of problems from C.P.A. examinations. Topics covered include governmental and institutional accounting, estates, trusts, receiverships, liquidations and consolidations. *Credit, 3.* Mr. Anderson.

577 (177). AUDITING.
The verification of accounting records dealing with audit theory and procedure. *Credit, 3.* Mr. Krzystofik.

578 (178). ADVANCED FEDERAL TAX PROCEDURES.
Advanced phases of Federal taxation with particular attention to inventories, depreciation, and accounting methods. Study and preparation of returns for partnerships, corporations, estates and trusts; Federal estate and Federal gift taxes.
Prerequisite, Accounting 273 (73). *Credit, 3.* Mr. Anderson.

General Business and Finance

502 (181). PROBLEMS IN BUSINESS FINANCE I.
Short- and intermediate-term financing; estimating requirements for funds and the major types of loan arrangements.
(Not open to M.B.A. candidates) *Credit, 3.* Mr. Tessier

503 (182). PROBLEMS IN BUSINESS FINANCE II.
Long-term financing; capital budgeting; leasing; reserves and dividend policy; pensions; company expansion; mergers and acquisitions and reorganizations.
(Not open to M.B.A. candidates.) *Credit, 3.* Mr. Tessier

520 (183). INVESTMENTS.
The principles and techniques that are useful for the analysis and selection of investment media; investment policies of individuals and institutions. *Credit, 3.* Mr. Ludtke.

521 (184). SECURITY ANALYSIS.
An examination of the factors effecting investment values of securities and the methods used in their analysis. Students are required to select one industrial group for intensive investigation. *Credit. 3.* Mr. Ludtke.

541 (166). Traffic Management.
The relationships and responsibilities among carriers, regulatory authorities and users of transportation services. *Credit, 3.* Mr. Rivers.

542 (167). Public Utilities.
The nature, organization and administration of regulated industries; aspects of public regulation at Federal, State, and Local levels as they affect service operations. *Credits, 3.* Mr. Rivers.

550 (178). Administrative Statistics.
Probability and statistical distributions applied to business management problems; application of Bay's theorem to sampling for business decision making under uncertainty. *Credit, 3.* Mr. Cheng or Mr. Theilman.

561 (172). Business Law II.
The law of agency and negotiable instruments; bankruptcy and wills.
Credit, 3. Mr. Smart.

563 (173). Business Law III.
The law of partnerships, corporations, real and personal property.
Credit, 3. Mr. Hartzler.

Management

531 (189). Management Decision Simulation.
A course involving participation in the management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market positions. *Credit, 2.* Mr. Elkins.

564 (169). Wage and Salary Administration.
A study of the objectives, procedures and problems involved in the establishment and administration of operative and executive compensation plans.
Credit, 3. Mr. Johnson.

565 (167). Management and Union Relations I.
A comparison of union-management objectives, functions and structures including the scope and impact of union penetration into areas of management authority. *Credit, 3.* Mr. Conlon.

566 (168). Management and Union Relations II.
A study of the human relations problems encountered in the interpretation and administration of collective bargaining agreements.
Prerequisite, Management 565 (167). *Credit, 3.* Mr. Conlon.

Marketing

576 (176). Purchasing.
Purchasing by industrial establishments, with emphasis on case problems in purchasing organization and practices. *Credit, 3.* Mr. Zane.

579 (179). Wholesaling.
The field of wholesaling, types and classes or organization including newer developments. The performance of purchasing and selling functions by wholesalers and manufacturers are considered in case problems.
Prerequisite, Marketing 253 (53). *Credit, 3.* Mr. Zane.

580 (180). PROBLEMS IN MARKETING.
Cases in Marketing Management; analysis, in depth, of questions concerning the interrelations of marketing functions including merchandising, distribution channels, pricing, and marketing research applied to specific companies and products.
Prerequisite, Marketing 253 (53). *Credit, 3.* Mr. Drew-Bear.

582 (182) PROBLEMS IN RETAILING.
Case analysis and decisions covering pricing; merchandise management; buying and selling policies; store systems; personnel; accounting control and plant operation.
Prerequisite, Marketing 253 (53). *Credit, 3.* Mr. Drew-Bear.

584 (184). PROBLEMS IN ADVERTISING.
The applications of procedures for planning campaigns including marketing research appropriations, choice of media, scheduling, preparation of copy and layout.
Prerequisites, Marketing 253 (53) and 273 (73). *Credit, 3.* Mr. Hardy.

CHEMICAL ENGINEERING

Head of Department
J. W. Eldridge
Acting Dean of Engineering
E. E. Lindsey
Professor
K. D. Cashin
Associate Professors
H. C. Duus
L. H. S. Roblee, Jr.
Assistant Professors
T. J. McAvoy
R. J. Novak
Visiting Lecturer
D. G. Chappelear

The graduate program in Chemical Engineering is designed to emphasize advanced study in engineering fundamentals rather than specific technological applications.

To be admitted to full graduate status in this field either of the following requirements should be met.

1. Applicant must have a Bachelor's degree in Chemical Engineering from a recognized school, or
2. Applicant must show satisfactory academic training or demonstrate proficiency in these subjects as a minimum:
   Mathematics: through Calculus.
   Chemistry: through Organic and Physical.
   Engineering Mechanics: Statics, Strength of Materials, Dynamics.
   Chemical Engineering: Stoichiometry, Unit Operations, Thermodynamics (including thermodynamics of chemical change).
   Electrical Engineering: Elements of Circuits and Machines.

REQUIREMENTS FOR M.S. DEGREE

1. Ch.E. 800 (300). Thesis, maximum 10 credits.
2. At least four Ch.E. 700 (200) series courses.
3. Additional graduate credit courses, chosen according to the student's interests from the fields of engineering, science, mathematics and the humanities, to constitute the total requirement of 30 credits for M.S. degree.
4. University-wide requirements as described on p. 22.

REQUIREMENTS FOR Ph.D. DEGREE

The department imposes no additional requirements beyond those established by the University and the Graduate School as described on p. 15.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700 (200). Special Problems. *Credit, 1-3.*

701 (201). Chemical Engineering Thermodynamics I.
A review of the fundamental laws of thermodynamics, P-V-T relations of fluids, thermodynamic functions, fluid flow, compression and expansion of gases, liquefaction and separation of gases.
Prerequisite, Chemical Engineering 581 (181) or equivalent.
Credit, 3. Mr. Eldridge.

702 (202). Chemical Engineering Thermodynamics II.
Phase equilibria and chemical reaction equilibria and their applications in chemical processing.
Prerequisites, Chemistry 586 (166) and Chemical Engineering 582 (182).
Credit, 3. Mr. Eldridge.

703 (203). Advanced Chemical Engineering Calculations I.
Application of advanced mathematical techniques to chemical engineering problems with emphasis on mechanics of solution and interpretation of the results. Topics covered include: vector analysis; partial differential equations; Fourier and special series expansions in the solution of boundary value problems.
Prerequisite, Chemical Engineering 361 (61) or equivalent.
Credit, 3. Mr. McAvoy.

704 (204). Advanced Chemical Engineering Calculations II.
A continuation of course 703 (203). In relation to chemical engineering problems the topics covered include numerical analysis, complex variables, conformal mapping and integral transform techniques.
Prerequisite, Chemical Engineering 703 (203) or equivalent.
Credit, 3. Mr. McAvoy.

705 (205). Chemical Reactor Design.
Study of the principles of chemical reaction kinetics and their application to industrial chemical processes. Systems homogeneous and heterogenous, batch and flow, catalyzed and uncatalyzed, isothermal and adiabatic are discussed.
Prerequisites, Chemistry 586 (166), Math 186 (32) or 541 (92) or equivalent.
Credit, 3. Mr. Chappelear.

706 (206). ADVANCED KINETICS AND REACTOR DESIGN.
A study of topics from the recent literature including reactions in gradients, catalysis and optimization of chemical reactors by methods of dynamic programming.
Prerequisites, Chemical Engineering 705 (205) and Chemical Engineering 361 (61) or equivalent. *Credit, 3.* Mr. Chappelear.

707 (207). ADVANCED PROCESS CONTROL.
A study of the theory of closed loop control. Use of LaPlace transforms and transfer functions; stability analysis, root-locus, Bode diagrams; frequency response and time response in controller design.
Prerequisite, Chemical Engineering 376 (76) or equivalent.
Credit, 3. Mr. Novak

708 (208). PROCESS DYNAMICS.
Translating process performance into mathematic form-application to control system design. Topics include fluid systems, thermal systems, mass transfer systems (distillation, drying), reaction kinetics.
Prerequisite, Chemical Engineering 707 (207). *Credit, 3.* Mr. Novak.

709 (209). OPTIMIZATION TECHNIQUES.
Fundamental ideas and application of optimization techniques in design and control. Topics include: extrema of functions of several variables, LaGrange multipliers, multi-stage allocation problems, (i.e., dynamic programming), functionals, calculus of variations, Lyapunov's second method.
Prerequisite, Chemical Engineering 361 (61). *Credit, 3.* Mr. Novak.

711 (211). ADVANCED CHEMICAL ENGINEERING.
Introduction to advanced work in chemical engineering which applies the transport of momentum, energy, and material. Background for fluid flow, heat transfer and mass transfer. Topics covered include: viscosity, thermal conductivity and diffusivity, momentum and energy balances, friction, turbulence, fluid friction, the motion of suspended solids in fluids, and non-Newtonian fluids.
Prerequisite, Chemical Engineering 256 (56). *Credit, 3.* Mr. Roblee.

712 (212). ADVANCED CHEMICAL ENGINEERING II.
A continuation of course 711 (211). Topics covered include: thermal conductivity and mass diffusivity, energy balances, analytical solutions for steady and unsteady state energy and mass transfer, radiation and convection, interphase transfer and over-all balances. Emphasis on problem solutions.
Prerequisite, Chemical Engineering 711 (211). *Credit, 3.* Mr. Roblee.

722 (222). ADVANCE HEAT TRANSFER II.
This course is designed for those graduate students who wish to continue the study of heat transfer beyond that presently offered in M.E. 221. The work load is evenly divided between theory and design. Subjects covered include natural and forced convection, heating and cooling both inside and outside of tubes, condensing vapors, boiling liquids and fluidized systems.
Prerequisite, Mechanical Engineering 578 (182) or Chemical Engineering 678 (178). *Credit, 3.* Mr. Cashin.

731 (231). Mass Transfer I.
Theories of diffusion leading to unified treatment of mass-transfer unit operations; molecular and eddy diffusion, mass-, heat-, and momentum transfer analogies, two film theory, diffusion in turbulent flow and related topics. The last third of the course deals with applications of these principles to general gas-liquid operations.
Prerequisite, Chemical Engineering 256 (56). *Credit, 3.* Mr. Roblee.

732 (232). Mass Transfer II.
A continuation of course 231. Application of principles to design factors in distillation, gas absorption, adsorption and ion exchange and liquid-liquid extraction. Other unit operations may be substituted for the above depending on the interests of the class.
Prerequisite, Chemical Engineering 731 (231). *Credit, 3.* Mr. Cashin.

781 (281). Nuclear Chemical Engineering.
Application of chemical engineering to the preparation of nuclear fuels: the recovery and reprocessing of reactor fuels, the preparation of moderator materials, and the disposal of radioactive wastes.
Prerequisite, Chemical Engineering 663 (183). *Credit, 3.* Mr. Marcus.

800 (300). Thesis, Master's Degree.
A theoretical or experimental study of some chemical engineering problem. Credit will be determined by the work done, and by agreement with the Department and the Graduate Thesis Committee. *Credit, 6-10.*

900 (400). Thesis, Ph.D. Degree.
A theoretical or experimental study of some chemical engineering problem. Credit will be determined by the work done, and by agreement with the Department and the Graduate Thesis Committee. *Credit, 26-30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

661 (161). Chemical Engineering Analysis.
Application of mathematical techniques to chemical engineering problems. The emphasis is on analysis of problems and the devising of satisfactory mathematical models. A part of the course is devoted to study of machine computation with digital and analog devices.
Prerequisites, Chemical Engineering 256 (56) and Math 256 (32).
Credit, 3. Mr. Roblee.

676 (176). Automatic Process Control.
A study of the theoretical and practical factors governing automatic control of industrial processes. Topics include control systems, measurement devices, control modes, mathematical relationships and laboratory work.
Prerequisites, Chemical Engineering 256 (56) and Math 256 (32).
Credit, 3. Mr. Novak.

678 (178). Advanced Unit Operations.
A more detailed study of certain unit operations, especially heat transfer.
Prerequisite, Chemical Engineering 256 (56). *Credit, 2.* Mr. Cashin.

663, 664 (183, 184). Survey of Nuclear Engineering I, II.
An introduction to the principles of nuclear physics and a survey of problems involved in the design and operation of nuclear reactors. Heat transfer, shielding, metallurgy, controls, waste disposal and health physics.
Two lectures, one laboratory period per week each semester.
Prerequisites, two semesters of chemistry and mathematics through integral calculus. *Credit, 3 each semester.* Mr. Marcus.

667 (187). Process Equipment Design.
The design of process equipment for the chemical industries: riveted pressure vessels, welded pressure vessels, piping, attachments and closures, etc.
Prerequisites, Chemical Engineering 256 (56) and Civil Engineering 53.
Credit, 2. Mr. Lindsey.

684. Plant Design.
A study of the application of the principles of stoichiometry, unit operations, thermodynamics and cost estimation to the design of chemical plants. The economic factors influencing the design are stressed. Lecture and laboratory.
Prerequisites, Chemical Engineering 256 (56) and Chemical Engineering 381 (81) or equivalent. *Credit, 3.* Mr. Cashin.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Chemical Engineering)

555 (155). Unit Operations I.
The fundamental principles underlying the unit operations of fluid flow, heat transfer, and evaporation; the thermodynamic properties of matter.
Four class hours, one 2-hour computation period.
Prerequisites, Mathematics 184 (30) or 185 (31) and Chemistry 208 (30).
Credit, 5. Mr. Cashin.

556 (156). Unit Operations II.
A continuation of course 555 (155) concerning distillation, gas absorption, liquid-liquid extraction, filtration and, if time permits, size reduction and separation. Three class hours, one 3-hour computation period.
Prerequisite, Chemical Engineering 555 (155). *Credit, 4.* Mr. Cashin.

558 (158). Organic Chemical Technology.
Some unit processes involved in the manufacture of organic chemicals; e.g., nitration, amination, halogenation, oxidation.
Prerequisite, Chemistry 561 (251). *Credit, 3.* Mr. Duus.

577 (177). Elements of Unit Operation.
Primarily for engineering science students. Emphasis is on the scientific principles of the Unit Operations. Molecular and turbulent transport of heat, mass and momentum are considered in detail.
Prerequisite, Engineering Science option or permission of instructor.
Credit, 3. Mr. Roblee.

581 (181). Heat-Energy Relations.
Energy relations in chemical processes, types of energy, energy balances, second law, thermodynamic function, including: P-V-T relations of fluids, compression and expansion processes.
Prerequisite, Chemistry 586 (66). *Credit, 3.* Mr. Duus.

582 (182). INDUSTRIAL EQUILIBRIA.
Phase and chemical equilibria and rates of reaction in chemical processes from the industrial point of view.
Prerequisites, Chemistry 586 (66) and Chemical Engineering 581 (181).
Credit, 3. Mr. Duus.

588 (188). CHEMICAL ENGINEERING LABORATORY.
A quantitative study of pilot plant size equipment illustrating some unit operations with special emphasis on the securing of accurate data, correct operating technique, and report writing. Field trips when possible.
Prerequisite, Chemical Engineering 556 (156). *Credit, 3.* The Staff.

CHEMISTRY

GRADUATE FACULTY

Head of Department
W. E. McEwen

Professors
G. W. Cannon
I. M. Hunsberger
H. N. Little
J. E. Roberts
J. H. Smith
R. S. Stein

Associate Professors
L. A. Carpino
A. M. Gawienowski
M. D. Rausch
T. Robinson

Assistant Professors
J. F. Brandts
J. A. Chandler
D. J. Curran
J. W. George
E. J. McWhorter
E. M. Mortensen
J. W. Olver
R. L. Rowell
T. R. Stengle
H. D. Stidham
R. M. Williams
O. T. Zajicek

The Department of Chemistry provides facilities for students intending to complete the requirements for the Master's degree and the Doctor's degree. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those who have not fulfilled these requirements may be admitted as special students until the deficiencies have been removed.

First year graduate students will take placement examinations during the first week of residence. These examinations are for the purpose of evaluating the background of the student, and to assist in the selection of a course of

study. Students are admitted to candidacy for a degree only after the completion of qualifying requirements. A research problem is carried out in one of the following fields of chemistry: physical, organic, inorganic, analytical, and bio-chemical.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

701 (221). Advanced Analytical Chemistry.
Laboratory consisting of special work to meet the needs of the individual students.
Prerequisite, Chemistry 513 (183) or equivalent.
Credit, 1-5. Mr. Roberts, Mr. Olver and Mr. Curran.

703 (223). Introduction to Micro-Chemistry.
Laboratory.—The applications of micro technique to synthesis, analysis, and characterization; the microscopic work may include the optics of the microscope, micrometry, the microscopic study of fibers, crystals, and physiochemical phenomena and an introduction to microscopical qualitative analysis; the quantitative work may include the determination of carbon, hydrogen, nitrogen, and halogens in organic materials and selected inorganic determinations.
Prerequisite, Chemistry 513 (183) or equivalent. *Credit, 3-5.* Mr. Roberts.

710 (226). Electroanalytical Chemistry.
Principles of electrochemistry and their relation to the newer electroanalytical methods.
Prerequisite, Chemistry 513 (183) or equivalent; corequisite, Chemistry 701 (221) or permission of instructor. *Credit, 3.* Mr. Curran and Mr. Oliver.

724 (234). Special Topics in Biochemistry.
One to three topics of current interest, which may include hormones, enzymes, and plant biochemistry. A maximum of six credits may be taken.
Prerequisite, Chemistry 524 (194). *Credit, 3-6.* Biochemistry Staff.

725 (235). Advanced Biochemical Techniques.
A laboratory course to provide experience in the isolation, identification, and analysis of biochemical compounds.
Prerequisite, Chemistry 524 (194). *Credit, 2-5.* Biochemistry Staff.

726 (236). Experimental Enzymology.
A course designed to give experience in the preparation and assay of enzymes.
Prerequisite, Chemistry 524 (194). *Credit, 2.* Mr. Robinson.

727 (237). Biocolloids.
The fundamental principles of colloidal behavior and some applications to industry, agriculture, and biology.
Prerequisite, Chemistry 562 (152) or equivalent.
Credit, 3. Biochemistry Staff.

728 (238). Biochemistry of Proteins.
A discussion of the chemical, physical and biological properties of proteins.
Prerequisites, Chemistry 524 (194) and 586 (166). *Credit, 3.* Mr. Little.

741 (201). Inorganic Preparations.
Laboratory.—The preparation and testing of various types of inorganic substances, to teach important techniques and give familiarity with the reactions and properties of inorganic materials. *Credit, 3-5.* Inorganic Staff.

742 (202). Inorganic Chemistry of the Less Familiar Elements.
Lectures and collateral reading on the descriptive chemistry of some of the less familiar elements such as boron, gallium, indium, thallium, the lanthanides, fluorine, titanium, vanadium, tantalum, tungsten, and uranium, with correlations between structure or spatial configurations and chemical properties.
Credit, 3. Mr. Roberts.

756 (216). Topics in Inorganic Chemistry.
Topics such as coordination chemistry, non-aqueous solvents, less familiar oxidation states, acid-base theories, reaction mechanisms, etc. will be offered.
Prerequisite, Chemistry 546 (186) or equivalent.
Credit, 2 each semester. Maximum Credit, 6. The Staff.

760, 761 (229, 230). Theoretical Organic Chemistry.
Lectures on special topics such as stereochemistry, bond formation, resonance, ionic reactions, free radical reactions, transition state theory, reaction mechanisms, molecular rearrangements, etc.
Prerequisite, Chemistry 571 (181) or permission of instructor.
Credit, 3 each semester. The Staff.

765 (231). Advanced Organic Chemistry.
Laboratory.—More difficult synthesis of organic compounds, frequently those desired as starting materials for research, will be assigned to the individual student. Their preparation will require the use of the original literature.
Prerequisite, a year course in Organic Chemistry. *Credit, 3-5.* The Staff.

770 (227). Heterocyclic Chemistry.
The chemistry of the common organic heterocyclic compounds containing nitrogen, oxygen, and sulfur. Consideration of mechanisms of the reactions discussed.
Prerequisite, Chemistry 571 (181) or equivalent. *Credit, 3.* The Staff.

771 (228). Organometallic Chemistry.
The chemistry of compounds containing carbon-metal and carbon-metalloid bonds. Preparation, structure, physical properties, chemical reactions, and synthetic applications of organometallic derivatives. Topics of current interest will be stressed.
Prerequisite, Chemistry 571 (181) or equivalent. *Credit, 3.* Mr. Rausch.

772 (239). Chemistry of Natural Products.
Natural products of current interest, primarily from the steroid, terpene, and alkaloid groups, with emphasis on structural proofs, stereochemistry, synthesis, and biogenetic relationships.
Prerequisite, Chemistry 571 (181) or permission of instructor.
Credit, 3. The Staff.

775(233). Special Topics in Organic Chemistry.
One to three topics of current interest will be discussed in detail. Recent development of theoretical and/or synthetic importance to organic chemistry will be covered. A maximum of six credits may be taken.
Prerequisite, Chemistry 571 (181) or permission of instructors.
Three class hours. *Credit, 3.* The Staff.

776 (232). Organic Chemistry.
An intensive survey of certain reactions of organic chemistry with emphasis on their scope and limitations, recent developments, and mechanisms.
Prerequisite, Chemistry 571 (181). *Credit, 3.* The Staff.

783 (203). Physical Chemical Measurements.
Laboratory.—Experiments selected from standard texts and from the literature in Physical Chemistry to meet the needs and background of the individual student.
Prerequisite, Chemistry 586 (166) or equivalent. *Credit, 3-5.* The Staff.

785 (205). Chemical Thermodynamics.
Introduction to Statistical Thermodynamics. Applications of Microcanonical, Canonical, Grand Canonical and Generalized Ensembles to chemical systems. Calculation of thermodynamic functions from spectroscopic data, fluctuations, imperfect gases, nearest neighbor lattice statistics and other special topics of current interest.
Prerequisite. Chemistry 595 (177) or equivalent. *Credit, 3.* Mr. Stidham.

787 (207). Chemical Spectroscopy, Technique and Applications.
Contains an introduction to the elementary theory, experimental techniques and interpretation of data obtained in applications of infrared, Raman, visible, ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy to the solution of chemical problems.
Prerequisite, Chemistry 586 (166) or equivalent.
Credit, 3. Mr. Stengle and Mr. Stidham.

788 (208). Chemical Spectroscopy.—Theory.
Contains an introduction to the theory of infrared, Raman, visible and ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy.
Prerequisites, Chemistry 787 (207) and permission of the instructors.
Credit, 3. Mr. Stidham and Mr. Stengle.

790 (220). Techniques of Polymer Characterization.
A study of experimental techniques for characterization of isolated polymer molecules and polymeric solids, including x-ray diffraction, birefringence, infrared dichroism, NMR, dynamic and static mechanical studies, microscopy, light scattering, solution techniques.
Prerequisites, Chemistry 586 (166), and Chemistry 798 (218) and 799 (219) (may be taken concurrently).
One lecture per week. *Credit, 1.* Mr. Stein and guest lecturers.

791, 792 (211, 212). Quantum Chemistry.
Quantum mechanics and its application to chemical problems. A discussion of the exact theory of structure of simple atoms, the application of approximate methods for complex atoms and molecules, the chemical bond, resonance, the interaction of radiation and matter, group theory.
Prerequisite, Chemistry 546 (186) or equivalent.
Credit, 3 each semester. Mr. Stein, Mr. Stengle and Mr. Stidham.

795 (215). Topics in Physical Chemistry.
Prerequisites, Chemistry 595 (177) and 546 (186) or equivalent.
Credit, 2 each semester. Maximum Credit, 6. The Staff.

797 (217). Organic Polymerization Reactions.
A study of mechanisms, kinetics, and thermodyamics of principal types of polymerization reactions and relationship to the properties or resulting polymers.
Prerequisites, Chemistry 166 (52), 586 (66). *Credit, 3.* The Staff.

798, 799 (218, 219). Physical Chemistry of High Polymers.
Structure of solid polymers, determination of molecular weights, sizes and shapes, mechanical properties of solid polymers, colligative properties of polymer solutions, polyelectrolytes, and physical chemistry of proteins.
Prerequisite, Chemistry 785 (205) or equivalent.
Credit, 3 each semester. Mr. Stein.

891 (251). Seminar.
Conferences, reports or lectures.
Credit, 1 each semester. Maximum credit, 2. Mr. Olver and Mr. Williams.

895 (295). Research Problem.
The student will prepare two proposals for rearch problems not directly related to his thesis topic if the latter has been selected. The problems will involve primarily library research. Required of all candidates for the Ph.D. in Chemistry and must be completed before the candidate's preliminary examination for the degree. *Credit 4.* The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

513 (183). Instrumental Analysis.
The theory and techniques of special methods of analysis such as colorimetry, potentiometry, microscopy, ion exchange, electro-deposition and other recently developed methods of analysis.
Two class hours, one 4-hour laboratory period.
Prerequisites, Chemistry 210 (32) and 586 (166).
Credit, 3. Mr. Roberts, Mr. Olver, and Mr. Curran.

515 (185). Theory of Analytical Processes.
A detailed consideration of analytical topics having general applicability in chemical investigations. Among the areas included are chemical equilibrium, precipitate formation, chelating agents, multistage separation, and quantitative methods for organic functional groups. Additional topics may be selected from the current literature. A one credit-hour laboratory will be available on an individual and optional basis.
Pre- or co-requisites, Chemistry 166 (52) and 586 (166).
Three class hours. *Credit, 3.*

One afternoon laboratory period (optional). *Credit, 1.*
Mr. Roberts, Mr. Olver, and Mr. Curran.

519 (180). Electronics Instrumentation for Scientists.
Laboratory oriented course designed for scientists which begins with electronic principles and leads through servo-systems, operational amplifiers, digital circuits, and other measurement devices.
Prerequisites, one year of physics and permission of instructor.
One class hour, one 4-hour laboratory period. *Credit, 3.* Mr. Curran.

523, 524 (193, 194). General Biochemistry.
A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field.
Three class hours, one 3-hour laboratory period.
Prerequisites, Chemistry 166 (152) or equivalent.
Credit, 4 each semester. Biochemistry Staff

544 (184). Radiochemistry.
The character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radionuclides.
Two class hours, one 3-hour laboratory period.
Prerequisite, Chemistry 210 (32) or 127 (27) or permission of instructor.
Credit, 3. Mr. Richason.

546 (186). Theoretical Inorganic Chemistry.
A survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanisms.
Prerequisite, Chemistry 585 (165). *Credit, 3.* Mr. George and Mr. Smith.

547 (187). Inorganic Chemistry of the Common Elements.
A systematic consideration of the chemistry of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices.
Three class hours (6 lab hours optional).
Prerequisite, Chemistry 546 (186) or permission of the instructor.
Credit, 3 (5). Mr. Zajicek and Mr. Chandler.

571 (181). Organic Chemistry.
An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments.
Three class hours.
Prerequisites, one year of Organic Chemistry and permission of instructor.
Credit, 3. The Staff.

572 (182). Qualitative Organic Chemistry.
Identification of unknowns, both single and mixtures of organic compounds, by physical properties, reactions and preparation of derivatives.
Two class hours, two 3-hour laboratory periods.
Prerequisites, one year of Organic Chemistry and permission of instructor.
Credit, 4. The Staff.

585 (191). Chemical Literature.
Intended to give facility in the location of information of a chemical nature. One class hour.
Prerequisites, Chemistry 166 (152) and 586 (166) and a reading knowledge of German or permission of instructor. *Credit, 1.* Mr. Oberlander.

590 (176). Advanced Physical Chemistry.
A survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas.
Prerequisite, Chemistry 586 (166). *Credit, 3.* The Staff.

595 (177). Advanced Physical Chemistry.
Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids.
Three class hours.
Prerequisites, Chemistry 586 (166). *Credit, 3.* Mr. Stengle and Mr. Stidham.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Chemistry)

520 (179). Elementary Biochemistry.
The more important facts relating to biological materials and processes. Designed primarily for students not eligible for courses 523 (193) or 524 (194). Not open to chemistry majors.
Three class hours, one 3-hour laboratory period. *Credit, 4.* Mr. Robinson.

561, 562 (151, 152). Organic Chemistry.
Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity.
Prerequisite, Chemistry 112 (2). *Credit, 3 each semester.* Organic Staff.

563, 564 (153, 154). Organic Chemistry. Laboratory.
Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds.
One 3-hour laboratory period.
Prerequisites, concurrent enrollment in Chemistry 561 (151) and 562 (152). *Credit, 1 each semester.* Organic Staff.

581 (161). Elementary Physical Chemistry.
A study of the basic principles of physical chemistry designed for students with a limited mathematical background. Not open to chemistry majors.
Prerequisites, Chemistry 112 (2); Physics 104 (4); Mathematics 124 (10).
Three class hours. *Credit, 3.* Physical Staff.

582 (162). Elementary Physical Chemistry.
A continuation of Chemistry 581 (161).
Two class hours, one 3-hour laboratory period. *Credit, 3.* Physical Staff.

585, 586 (165, 166). Physical Chemistry.
A study of the fundamental theories and laws of physical chemistry.
Prerequisites, Mathematics 174 (26) and Physics 104 (4).
Corequisite, Chemistry 210 (32). *Credit, 3 each semester.* Physical Staff.

587, 588 (167, 168). PHYSICAL CHEMISTRY LABORATORY.
Experience in modern physicochemical techniques.
Concurrent enrollment in Chemistry 585, 586 (165, 166) required.
Credit, 2 each semester. Mr. Stengle and Physical Staff.

CIVIL ENGINEERING

GRADUATE FACULTY

Head of Department
M. P. White

Professors
C. E. Carver, Jr.
T. H. Feng
K. N. Hendrickson
E. C. Osgood

Associate Professors
W. W. Boyer
G. R. Higgins

Assistant Professors
A. Chajes
D. B. Harris
M. M. Miller

The Department offers both the Ph.D. and the M.S. degree. For the Ph.D. degree no additional requirements are imposed by the Department other than the general requirements established by the Graduate School of the University. For the M.S. degree, the following requirements must be met:

In addition to the general University requirements for admission to the Graduate School, each candidate in Civil Engineering must satisfy the following departmental requirements: (a) must submit a record of graduate record examination if graduated from an unaccredited institution, or if applying from a foreign country where this examination is offered, (b) must indicate his major field of interest (fluid mechanics, soil mechanics, structures, transportation engineering, sanitary engineering, etc.).

Three options are offered in the department: (1) Mechanics and Structures, (2) Transportation Engineering, (3) Sanitary Engineering.

Students must satisfy one of the following core curricula:

CORE CURRICULUM FOR MECHANICS AND STRUCTURES OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Strength of Materials II—C.E. 540 (188).
3. Introduction to Hydrodynamics—C.E. 556 (193).
4. Dynamics of Machinery—M.E. 585 (185).
5. Advanced Engineering Mathematics—Math 585 (175).
6. Thesis.

CORE CURRICULUM FOR TRANSPORTATION ENGINEERING OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Open Channel Flow—C.E. 561 (187).
3. Theoretical Soil Mechanics—C.E. 720 (279).
4. Principles of Engineering Statistics—I.E. 572 (172).
5. Municipal Government—Govt. 519 (151).
6. Thesis.

CORE CURRICULUM FOR SANITARY ENGINEERING OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Hydraulic Engineering—C.E. 562 (192).
3. General Applied Bacteriology—Public Health 581 (181).
4. Principles of Engineering Statistics—I.E. 572 (172).
5. Municipal Administration—Govt. 575 (178).
6. Water and Waste Water Analysis—C.E. 572 (185).
7. Thesis.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700 (200). Special Problems. *Credit, 3-6.* The Staff.

710 (257). Transportation Analysis and Planning.
The analysis of traffic and transportation engineering problems in highways, railroads and airports and the planning related to those facilities.
Prerequisite, Civil Engineering 511 (194). *Credit, 3.* Mr. Boyer.

720 (279). Theoretical Soil Mechanics.
The phenomena in soil masses subjected to such forces as seepage, frost and imposed loads. *Credit, 3.* Mr. Hendrickson.

721 (280). Applied Soil Mechanics.
The solution of case problems applying the principles of soil mechanics to the design of embankments, retaining walls, footings, raft foundations, and pile structures.
Prerequisite, Civil Engineering 720 (279). *Credit, 3.* Mr. Hendrickson.

722 (281). Seepage Analysis.
An analytical study of groundwater and seepage problems related to earth structures.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Hendrickson.

723 (282). Shear Strength of Clay.
A survey of current theory and research into the strength characteristics of clay. *Credit, 3.* Mr. Bemben.

730 (270). Advanced Structural Theory.
Plastic analysis and design of steel frames.
Prerequisites, Civil Engineering 331 (71) and 532 (172). *Credit, 3.* Mr. Osgood.

731 (271). Special Structures.
The analysis and design of two-hinged and hingeless arches and of folded plate and shell roofs.
Prerequisites, Civil Engineering 331 (71), 532 (172) and 333 (73). *Credit. 3.* Mr. Osgood.

733 (273). Advanced Topics in Concrete.
Prestressed concrete theory. Methods of analysis applicable to various types of reinforced concrete building frames; elastic theory and ultimate strength procedures. Consideration of beam and girder, flat slab, slab-band, flat plate, lift slab, and rigid frame construction. Design of columns subject to bending and direct stress. *Credit. 3.* Mr. Osgood.

741 (252). Structural Dynamics.
The behavior of linear and non-linear mechanical systems subjected to periodic forces, to non-periodic forces and to shock loads.
Prerequisites, Civil Engineering 141 (36) and 242 (37). *Credit, 3.* Mr. White.

742 (261). Experimental Stress Analysis.
Experimental procedures for determination of stresses and strains due to static and dynamic loads.
Prerequisite, Civil Engineering 142 (37). *Credit, 3.* Mr. Harris.

743 (288). Elasticity.
General equations of the mathematical theory of elasticity in space. Plane strain and plane stress in cartesian, polar and general orthogonal co-ordinates.
Credit, 3. Mr. Dzialo.

744 (289). Theory of Plates.
A presentation of the classical theory of plates as well as modern developments. Relationship of the general theory of elasticity to plate theory.
Credit, 3. Mr. Miller.

745 (290). Structural Stability.
A study of the elastic stability of engineering structures. Bending of bars, buckling of thin plates and shells; dynamic stability of bars and plates.
Credit, 3. Mr. Dzialo and Mr. Chajes.

757 (275). Advanced Fluid Mechanics.
Hydraulic similitude, dimensional analysis, methods of obtaining dynamic similarity in hydraulic models in actual practice, analysis of typical hydraulic models.
Prerequisite, Civil Engineering 257 (75).
Credit, 3. Mr. Carver and Mr. Higgins.

770 (277). Advanced Sanitary Engineering.
Hydraulic and chemical problems encountered in the design and operation of water and sewage works, stream sanitation and the latest trends of practice and research in sanitary engineering.
Prerequisites, Civil Engineering 260 (77) and 270 (78). *Credit, 3.* Mr. Feng.

780 (262). Fundamental Mechanics of Materials.
Mechanical and physical properties of materials related to crystal structure and symmetry. *Credit, 3.* Mr. Harris.

800 (300). Thesis, Master's Degree.
Required of all candidates. *Credit, 6.*

900 (400). Thesis, Ph.D. Degree.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

505 (191). Surveying III.
Elements of astronomical, geodetic and photogrammetric surveying, co-ordinate systems and map projections.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 102 (32). *Credit, 3.* Mr. Boyer

511 (194). Advanced Transportation Engineering.
Analysis of the engineering aspects of traffic problems such as traffic signal design, street capacities, parking and channelization.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 210 (55). *Credit, 3.* Mr. Boyer.

522 (182). Soil Testing.
Sampling and testing of soils for engineering purposes.
One class hour, two 3-hour laboratory periods.
Prerequisite, Civil Engineering 220 (80) or equivalent.
Credit, 3. Mr. Hendrickson.

532 (172). Theory of Structures II.
The analysis of statically indeterminate structures by several appropriate methods.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 230 (70). *Credit, 3.* Mr. Osgood.

534 (174). Theory of Structures III.
The analysis and design of complex or special structures in metal, concrete or wood.
Prerequisites, Civil Engineering 331 (71), 532 (172), 333 (73) concurrently.
Credit, 3. Mr. Osgood.

540 (188). Strength of Materials II.
Determination of stresses and strains in elements of machines and structures.
Prerequisite, Civil Engineering 242 (37). *Credit, 3.* Mr. White.

541 (154). Dynamics II.
A continuation of the first course in dynamics, using vector methods. Dynamics of a system of particles, kinematics and kinetics of a rigid body in space, top motion, simple gyroscopes.
Prerequisite, Civil Engineering 141 (36). *Credit, 3.* The Staff.

556 (193). Introduction to Hydrodynamics.
A mathematical treatment of the basic theorems of classical hydrodynamics—potential flow, conformal mapping, wave and vortex motion, Navier-Stokes equations and boundary layer theory.
Prerequisite, Mathematics 186 (32). *Credit, 3.* Mr. Carver.

559 (189). Fluid Mechanics of the Oceans.
An introduction to physical oceanography covering tides and waves, characteristics of sea water, advective and convective processes in the ocean and atmosphere, oceanographic measurements, planetary models of the oceans.
Prerequisites, Physics 105 (5) or equivalent and Mathematics 186 (32).
Credit, 3. Mr. Carver and Mr. Higgins.

561 (187). Open Channel Flow.
A study of steady flow in open channels including backwater curves in natural and artificial channels, hydraulic jump, channel bends and transitions, sediment transport, surges and waves, breakwaters and hydraulic structures.
Prerequisite, Civil Engineering 257 (75). *Credit, 3.* Mr. Higgins.

562 (192). Hydraulic Engineering.
The analysis and design of hydraulic structures such as storage reservoirs, spillways, dams, levees, shore protection and channel works.
Prerequisite, Civil Engineering 257 (75). *Credit, 3.* Mr. Higgins.

572 (185). Water and Waste Water Analysis.
Analysis of water relative to its quality for various domestic and industrial uses and analysis of waste water relative to its potentiality of pollution.
Two class hours, one 3-hour laboratory period.
Prerequisites, Chemistry 112 (2), Civil Engineering 270 (78).
Credit, 3. Mr. Feng.

573 (186). Sanitary Engineering III.
The hydraulics and chemistry of water and sewage treatment; layout and design of water and sewage treatment plants.
Prerequisites. Civil Engineering 260 (77) and 270 (78). *Credit, 3.* Mr. Feng.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Civil Engineering)

520 (180). Soil Mechanics.
Properties of soil and its behavior as an engineering material. Principles of classification, permeability, shear strength and compressibility and applications to simple field problems.
Two class hours, one 3-hour laboratory period.
Prerequisite, Geology 280 (50). *Credit, 3.* Mr. Hendrickson.

571 (179). Principles of Sanitary Engineering.
For students in the Department of Public Health. Covers phases of Civil Engineering 260 (77) and 270 (78) with consideration of the non-engineering background of the student. *Credit, 3.* Mr. Feng.

ECONOMICS

GRADUATE FACULTY

Acting Head of Department
B. R. Morris

Professors
P. L. Gamble
M. C. Howard
S. Schoeffler

Associate Professor
J. L. Blackman, Jr.

Assistant Professor
K. P. Wickman

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

Candidates for admission should have been in the upper half of their graduating class, should have at least one year of elementary study in Economics and an additional year and one-half of study (total 15 credits) in

Economics, related fields, or equivalent experience, and shall submit Graduate Record Examination scores. Prerequisites shall have been fulfilled within the prior five years, unless waived by the Deparment. Students are required to give proof of proficiency in English before beginning course work. Deficiencies in the above requirements may be waived but must be removed during the first year after admission.

700 (200). Special Studies in Economics.
Credit, 2-5 each semester. The Staff.

701, 702 (231, 232). Micro-Economic Theory.
A systematic development of the theory of the consumer, the firm, the industry, and their interactions.
Prerequisite, Economics 201 (73).
Credit, 3 each semester. Mr. Schoeffler and Mr. Martin.

705, 706 (211, 212). Macro-Economic Theory.
Nature, construction and use of social accounting systems. A systematic development of static and dynamic theories of aggregative economic behavior and their applications.
Prerequisite, Economics 212 (54) or 214 (56) or equivalent.
Credit, 3 each semester. Mr. Miller.

711 (213). Monetary Policy.
The organization, problems, and policies of the major central banks. Given as required.
Prerequisites, Economics 211 (53), 212 (54) or equivalent.
Credit, 3. Mr. Gamble.

731 (234). Monopoly and Public Utility Problems.
The problem of social control of monopolies and industries affected with a public interest. Given as required. *Credit, 3.* Mr. Howard.

741 (236). Collective Bargaining.
The legal background of collective bargaining, the process, subject matter, and problems involved. Individual case problems.
Prerequisite, Economics 241 (79). *Credit, 3.* Mr. Blackman.

751 (251). Mathematical Economics and Economic Model-Building.
The various modern applications of mathematics to economic analysis. Both static and dynamic processes will be examined. Given as required. Admission by consent of instructor.
Prerequisites, Economics 301 (73), 251 (75), or the equivalent and one year of college mathematics. *Credit, 3.* Mr. Schoeffler.

752 (252). Econometrics.
The application of modern statistical methods to macro- and micro-economic theory that has been formulated in mathematical terms.
Prerequisites, Economics 252 (76) and one year of college mathematics or consent of the instructor. *Credit, 3.*

761, 762 (261, 262). General Economic History.
Topics in the history of economic activity in the western world.
Prerequisite, Economics 261 (81). *Credit, 3.* Mr. Gelfand.

771 (281). Economic Planning.
Various kinds of economic plans in effect or proposed. Appraisal of the techniques of economic planning. *Credit, 3.* Mr. Morris.

801 (240). History of Economic Thought.
Treatment in depth of various topics within the history of economic thought. Given as required.
Prerequisite, Economics 306 (86) or consent of instructor.
Credit, 3. Mr. Martin.

811 (271). Taxation.
The assessment and administration of taxes with particular attention to the economic and social effects of individual taxes and tax systems.
Prerequisite, Economics 312 (78). *Credit, 3.* Mr. Gamble.

812 (214). Fiscal Policy.
The theory and practices of government finance with special reference to the United States. Given as required.
Prerequisites, Economics 211 (53), 312 (78). *Credit, 3.* Mr. Gamble.

891, 892 (291, 292). Seminar on Economic Policy.
Selection and application of the tools of economic analysis to major problems of public policy. *Credit, 1-3 each semester.* The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

Added work required of graduates: (a) extra reading on same or additional assignments, (b) term paper, (c) special problem or project.

511(153). Money, Banking and Credit.
The development and operation of the monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. *Credit, 3.* Mr. Gamble.

512 (154). Money, Income and Monetary Policy.
The relationships among money, income and monetary policy. An examination of the relationships among individuals, banks, money markets, governments and central banks.
Prerequisites, Economics 211 (53) or consent of the instructor.
Credit, 3. Mr. Gamble.

514 (156). Business Fluctuations and Forecasting.
Nature and causes of business fluctuations; methods of forecasting; government policy for stability; utility of available statistical data as guides to private and pubilc policy.
Prerequisites, Economics 211 (53) or Finance 210 (55).
Credit, 3. Mr. Miller.

521 (171). THE INTERNATIONAL ECONOMY.
An historical and analytical introduction to the study of international economic institutions, trade, finance, and policy. *Credit, 3.* Mr. Miller and Mr. Aitken.

522 (172). INTERNATIONAL TRADE AND ECONOMIC POLICY.
Intermediate theory of international trade including the analysis of the balance of payments mechanism, pure non-monetary theory and its application to the problems of commercial policy.
Prerequisites, Economics 521 (171) or consent of instructor.
Credit, 3. Mr. Miller and Mr. Aitken.

531 (183). SOCIAL CONTROL OF BUSINESS.
The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation or public enterprises for competition. *Credit, 3.* Mr. Howard.

532 (170). THE STRUCTURE OF AMERICAN INDUSTRY.
Business enterprise, market competition, and economic development in American industries. The social effectiveness of industries analyzed through measures of industrial structure and market performance. *Credit, 3.* Mr. Howard.

541 (179). LABOR PROBLEMS.
Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them. *Credit, 3.* Mr. Blackman.

542 (180). LABOR LAW AND LEGISLATION.
Economic effects and historical survey of Federal and state laws and an analysis of important court decisions.
Prerequisite, Economics 241 (79). *Credit, 3.* Mr. Blackman.

548 (155). ECONOMICS OF CONSUMPTION AND PERSONAL FINANCE.
Patterns of consumption, standards of living and the sources and expenditure of individual and family incomes. *Credit, 3.* Mr. Morris.

551 (175). MATHEMATICAL METHODS IN ECONOMICS.
The application of various mathematical concepts and techniques in macro-economic and micro-economic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economic phenomena.
Prerequisites, One year of college mathematics, or consent of instructor.
Credit, 3.

552 (176). ECONOMETRICS.
The application of mathematical and statistical methods to economic theory. Special emphasis is placed on the application to both micro- and macro-economic policy issues.
Prerequisites, Statistics 121 (21), or Statistics 355 (55) and Economics 251 (75), or permission of the instructor. *Credit, 3.*

561 (181). EUROPEAN ECONOMIC EVOLUTION.
Evolution of agriculture, manufacturing, banking, and other sectors of the European economy. *Credit, 3.* Mr. Gelfand.

566 (182). Economic Development.
Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. *Credit, 3.* Mr. Morris.

571 (184). Comparative Economic Systems.
The structure, operation, and underlying ideology of the major contemporary forms of social-economic organization. Emphasis on the Soviet Union and the United States. *Credit, 3.* Mr. Schoeffler.

581 (185). Regional Economics.
Examination of the U.S. distressed economic areas problem; application of location theory and basic techniques of regional analysis; empirical studies of industrial location.
Prerequisites, Economics 232 (70) or permission of instructor.
Credit, 3. Mr. Wickman.

582. Urban Economics.
Theory and method in metropolitan analysis; case studies of urban economic growth; economics of urban transportation planning, urban renewal, and financing of urban services.
Prerequisite, Economics 25. *Credit, 3.* Mr. Wickman

601 (173). Modern Economic Theory and Analysis.
Micro-economic analysis; types of markets; applications of linear programming, theory of games and other techniques for rational business planning; balancing forces in free-enterprise economy. *Credit, 3.* Mr. Schoeffler.

604 (188). Financial Aspects of Economics.
The application of modern flow-of-funds analysis to the financial behavior of the various sectors of the economy. Special emphasis is placed on the financial aspects of business units and the business sector.
Prerequisites, Accounting 125 (25) or consent of instructor.
Credit, 3. Mr. Martin.

606 (186). Doctrinal Backgrounds of Contemporary Theory.
Foundations of classical theory from physiocracy through Mill; neoclassicism and its chief variants, the Lausanne, Austrian and English schools; dissenters Marx, German historical school, Veblen. *Credit, 3.* Mr. Martin.

612 (178). Public Finance.
Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment, economic growth and price stability. *Credit, 3.* Mr. Gamble.

691, 692 (195, 196). Seminar. *Credit, 1-3.* The Staff.

EDUCATION

GRADUATE FACULTY

Dean
A. W. Purvis

EDUCATION

Professors

A. S. Anthony
C. V. Jones
C. F. Oliver
R. Wyman

Associate Professors

W. G. Kornegay
R. R. Pippert

Assistant Professors

R. L. Byrne, Jr.
A. A. Clegg, Jr.
R. C. Jones
L. Thelen

The following programs leading to the Certificate of Advanced Graduate Study are offered. Each program requires a minimum of sixty credits beyond the Bachelor's degree and the specific program of each candidate must be approved by the candidate's Advisory Committee.

(1) Reading Specialist. Prerequisites, teacher certification and two years of approved teaching. Recommended program: Education 420, 449, 653, 677, 701 or 705, 715, 783, 784, 785, 991 and electives; 21-30 hours in such related graduate courses as abnormal psychology, exceptional child, phonetics, audiology, psychological tests, diagnosis and treatment of behavior problems.

(2) School Guidance Specialist. Prerequisites, teacher certification and one year of approved teaching. Recommended program: Education 449, 677, 701, 705, 715, 912, 913, 915, 917, 991 and electives; 21-30 hours in such related graduate courses as psychological and individual testing, exceptional child, abnormal psychology, theories of personality, sociology, and counseling techniques.

(3) School Principals and Supervisors. Prerequisites, teacher certification and three years of approved teaching and/or administrative experience. Recommended program: Education 410, 449, 653, 677, 700 or 701, 766, 816, 951, 952 or 953, 955, 956, 991 and electives; 21-30 hours in related graduate courses in such fields as government, business administration, economics, sociology and psychology.

(4) Specialists in Audiovisual Education. Prerequisites, teacher certification and two years of approved teaching, including one year's experience in the audiovisual field. Recommended program: Education 420, 421, 422, 423, 511, 560, 666, 700 or 701, 850, 852, 951, 955, 991 and electives; 21-30 hours in related graduate courses in such fields as engineering, psychology, physics, and statistics.

Before being admitted to candidacy for the Master of Education degree,[1] the student must have, in addition to minimum Graduate School requirements:

1. For programs in secondary education eighteeen semester credits of such fundamental professional courses as Education 251, 253, 352, 353, 372, 375, 385, etc. Also a major (24 semester credits) and a minor (15 semester credits) in the subject matter fields to be taught.
2. For programs in elementary education twenty-four semester credits of such fundamental professional courses as Education 251, 260, 261, 262,

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[1]For a description of the Master of Arts in Teaching see page 17.

264, 385, etc., a broad general education including a minor (15 semester credits) in Arts and Sciences.

3. For programs in both fields experience in teaching is required. Students entering without teaching experience must arrange for student teaching (without graduate credit) as soon as possible.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

410 (110). Evaluation in Elementary Schools.
Standardized and teacher made tests, rating scales, report cards, growth charts, readiness measures, and diagnosis of educational deficiency in elementary pupils. (To be taken instead of Education 653 (153) by those training for elementary teaching.) *Credit, 3* Miss McManamy.

420 (120). Construction of Audiovisual Aids.
Designed to help teachers and audiovisual specialists to prepare audiovisual materials for use in an educational program. Students will prepare slides, graphics, recordings, still pictures, motion pictures.
Prerequisite, Education 666 (166). *Credit, 3.* Mr. Sleeman.

421 (121). Teaching with Television and Radio.
Provides the classroom teacher with an understanding of television and radio so that he can participate in the preparation, utilization, and evaluation of educational programs using these media.
Prerequisite, Education 666 (166). *Credit, 3.* Mr. Hulsen.

422 (122). Photography in Education.
Theory and practice of taking and processing photographs for use in educational activities.
Prerequisites, Education 420 (120) and 666 (166). *Credit, 3.* Mr. Sleeman.

423 (123). Audiovisual Technology.
Applications of acoustics, electricity, magnetism, mechanics and optics to audiovisual equipment and techniques.
Prerequisite, Education 666 (166). *Credit, 3.* Mr. Wyman.

430 (130). Elementary School Science.
Methods and materials of instruction. *Credit, 3.* Mr. King.

431 (131). Elementary School Social Studies.
Recent findings in research in terms of their implications for the elementary school social studies program. *Credit, 3.* Mr. Clegg.

445 (145). The School Adjustment Counselor.
Principles and practices of school adjustment counseling.
Credit, 3. Mr. Zimmer.

449 (149). Data Processing for Schools.
Theory and practice in the use of simple types of data processing equipment in scheduling, record keeping, and registers.
Prerequisites, Education 653 (153) or 991 (291). *Credit, 3.*

700 (200). Problem.
A critical study of some problem in the educational field. Two bound copies of the written report must be provided for the School of Education by the student.
Prerequisite, Education 991 (291) or its equivalent. *Credit, 1-4.* The Staff.

701 (201). Practicum.
Practice in the application of educational theory and technique in the public schools in such fields as supervision, administration, audiovisual organization, and guidance. The student will prepare a comprehensive written report of his practice, experience and problems. A student cannot offer both Education 700 (200) and 701 (201) for the Master's degree.
Prerequisites, Education 991 (291) and teaching experience.
Credit, 1-4. The Staff.

702 (202). Independent Study. *Credit, 1-6.* The Staff.

705 (216). Seminar in Education.
An intensive analytical study of some phases of education.
Credit, 2-6. The Staff.

715 (215). Workshop in Education[1].
Group study of practical problems in curriculum, instruction, and administration for school personnel in service. *Credit, 2-6.* The Staff.

730 (244). Measurement for Guidance.
Analysis of measurement devices in school guidance, including sociometrics, value scales, inventories, and other tests.
Prerequisites Psych. (181) 611 or consent of instructor. *Credit, 3.*

766 (289). Curriculum Development: Theory and Research.
Curriculum design and theory, the dynamics of change, current research studies and experimental programs, and theories of teaching and learning as they affect curriculum design.
Prerequisites: Education 511 (188) or 560 (160). *Credit, 3.* Mr. Clegg.

767 (285). Developments in Elementary School Mathematics.
A critical evaluation of the current literature, research and studies in the curriculum and teaching of elementary school mathematics.
Prerequisite Ed. 562 (161). *Credit, 3.* Mr. Hall.

768 (258). Implementing the Elementary School Program.
Curriculum design and classroom organization, including practices in planning, presenting, and evaluating programs involving integration of skills and activities for the various grade levels.
Prerequisite, Education 560 (160) and teaching experience.
Credit, 3. Miss O'Leary.

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[1]No more than six credits can be taken in Education 715 (215).

781 (262). Teaching of Reading on the Secondary and Adult Levels.
Principles, methods and materials for the teaching of developmental, remedial, and accelerated reading programs. The course is designed for teachers of students at the junior and senior high school levels, and for leaders of adult and college reading programs.
Prerequisite, Ed. 561 (161). *Credit, 3.*

782 (257). Children's Literature.
The basic types and foremost works in the literature for children. Attention to different interest and vocabulary levels and to the criteria for selection of lists for individual children.
Prerequisite, Education 561 (161). *Credit, 3.* The Staff.

783 (263). Diagnosis of Reading Difficulties.
Theory and interpretation of diagnostic procedures to develop a background of information in the diagnosis and treatment of reading difficulties.
Prerequisite, Education 561 (161). *Credit, 3.* Mr. Byrne.

784 (264). Individual Case Studies of Reading Problems.
Practical experience in the gathering and summation of information to form a case study of a child in order to determine the seriousness of the reading problem and the underlying causes and to make recommendations for their correction or remediation.
Prerequisite, Education 783 (263). *Credit, 3.* Mr. Byrne.

785 (265). Techniques in Remedial Reading.
Methods and materials in diagnosis and remedial instruction.
Prerequisite, Education 561 (161). *Credit, 3.* Miss O'Leary.

810 (278). The Language and Logic of Teaching.
Study of the limits and resources of language including consideration of logic, definitions, and rhetoric as they apply to teaching. *Credit, 3.* Mr. Warner.

811 (280). Developments in Secondary School Science.
A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school science.
Prerequisite, Education 510 (152) and teaching experience.
Credit, 3. Mr. Thelen.

812 (281). Developments in Secondary School English.
A critical evaluation of the current literature, yearbooks, research, and experiments in the curriculum and teaching of English.
Prerequisite, Education 510 (152) and teaching experience.
Credit, 3. Mr. Warner

813 (282). Developments in Secondary School Social Studies.
A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school social studies.
Prerequisite, Education 510 (152) and teaching experience.
Credit, 3. Mr. Anthony.

814 (283). Developments in Secondary School Mathematics.
A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school mathematics.
Prerequisite, Education 510 (152) and teaching experience.
Credit, 3. Mr. Hillman.

816 (284). THE JUNIOR HIGH SCHOOL.
The history of the Junior High School movement; the philosophy, aims and functions of a Junior High School, the instructional program, the role of the basic skills, guidance, organization, extra-curricular activities, and current trends. *Credit, 3.* Mr. Kornegay.

850 (267). AUTO-INSTRUCTIONAL DEVICES AND PROGRAMED LEARNING.
Theory and practice of programed learning for typical school subjects. Each student will set up objectives and construct a program for a unit of work. Implications for future use in education will be considered.
Prerequisite, Education 666 (166). *Credit, 3.* Mr. Wyman.

852 (268). ADMINISTRATION OF AUDIOVISUAL SERVICES.
To prepare audiovisual coordinators, directors and supervisors in the operation of an audiovisual service. Teacher training, selection of materials and equipment, storage, cataloging, distribution, maintenance, and financial support.
Prerequisites, Education 666 (166) and teaching experience.
Credit, 3. Mr. Wyman.

854 (269). NEWER MEDIA IN EDUCATION.
To acquaint school administrators, supervisors, and experienced classroom teachers with the characteristics, applications and implications of the newer media in education such as language laboratories, motion pictures, closed circuit television and teaching machines.
Prerequisite, Education 666 (166) or consent of instructor.
Credit, 3. Mr. Wyman.

880 (231). CONTEMPORARY PROBLEMS IN EDUCATION.
An intensive examination of several major issues confronting American education. Evaluation, and criticism of proposals being offered for their solution.
Credit, 3. Mr. Eddy.

881 (230). COMPARATIVE EDUCATION.
Objectives of descriptive, analytical and comparative educational methods; detailed description of selected foreign educational systems and an analysis of characteristic practices; relevance of the analysis to the problem of education for international understanding.
Prerequisite, Education 551 (151). *Credit, 3.* Mr. Wellman.

884 (235). EDUCATIONAL SOCIOLOGY.
Consideration of sociological and anthropological concepts and current studies in terms of their application to the American school system and its problems.
Prerequisite, Sociology 101 (1) or consent of the instructor.
Credit, 3. Mr. Anthony.

887 (232). HISTORY OF AMERICAN EDUCATION.
The development of American education in the context of American intellectual thought. *Credit, 3.* Mr. Angus.

890 (233). HISTORY OF WESTERN EDUCATIONAL THOUGHT THROUGH THE RENAISSANCE.
A study of representative educational thinkers from ancient times through the Renaissance.
Prerequisite, Education 551 (151) or consent of the instructor.
Credit, 3. Mr. Wellman.

891 (234). History of Western Educational Thought Since the Renaissance.
A study of representative educational thinkers from the Renaissance to the present.
Prerequisite, Education 551 (151) or consent of the instructor.
Credit, 3. Mr. Eddy.

900 (400). Thesis, Ed.D. Degree. *Credit, 15-30.* The Staff.

910 (245). School Counseling Theory.
Counseling theory and research evaluation. Study of methodology, philosophies, ethics, problems, and issues of school counseling.
Prerequisite, Education 677 (177). *Credit, 3.*

911 (246). School Counseling Procedures.
Instruments and techniques used in guidance work such as observation, methods of individual appraisal, record keeping, and school-community liaison practices.
Prerequisites, Education 910 (245) Psych. 611 (245) or Ed. 730 (244).
Credit, 3. Mr. Fredrickson.

912 (240). Occupations and Placement in School Guidance.
The collection, evaluation and use of occupational, educational, and placement information with individuals and groups of students in school guidance.
Prerequisites, Education 677 (177), teaching experience and permission of the instructor. *Credit, 3.* Mr. Fredrickson.

913 (241). Administration of School Guidance Services.
Operative framework of guidance programs in terms of personnel, functions, physical facilities, institutional integration, finance and laws.
Prerequisites, Education 677 (177), teaching experience and permission of the instructor. *Credit, 3.*

914 (249). Student Personnel Services in Higher Education.
Origin, growth, and operation of student personnel services in American colleges and universities. Research and methods of evaluation. Specific personnel services such as selection and admission of students, orientation to college life; student financial aid, student activities, and discipline.
Prerequisites, Education 677 (177) and consent of instructor.
Credit, 3. Mr. Burkhardt.

915 (243). Group Activities in Guidance.
A guidance study of school groups. Attention will be given to group dynamics, discussion techniques, group counseling, sociometric methods, and other school group activities.
Prerequisite, Education 677 (177), Psychology 665 (188), and background in Psychology. *Credit, 3.* Mr. Zimmer.

916 (247). Clinical Studies in School Guidance.
Intensive case studies of youth.
Prerequisites, Education 911 (246) and Psych. 611.
Credit, 3. Mr. Fredrickson.

917 (242). Elementary School Guidance.
A study of skills, techniques, and objectives of guidance in the elementary school, emphasizing those aspects of guidance of particular interest to the elementary school teacher or guidance person.
Prerequisites, Education 677 (177), Psychology 665 (188), and background in Psychology. *Credit, 3.* Mr. Zimmer.

928 (248). Internship in School Guidance and Counseling.
Supervised on-the-job counseling experience. Work includes direct counseling, individual supervisory conferences, writing of case reports, and the analysis of taped counseling sessions.
Prerequisite, Consent of instructor. *Credit, 3-6.* The Staff.

929 (250). Adjustment Counseling Casework.
Supervised experience with children having special adjustment problems. (To be taken in place of Education 928 (248). *Credit, 6.* Mr. Zimmer.

950 (205). Fundamentals of Educational Administration.
Introductory course in general school administration, the relation of public education to the cultural pattern, organization, and practices in school administration. *Credit, 3.* Mr. C. V. Jones.

951 (214). Principles of Supervision.
Principles and problems of supervision and the exercise of educational leadership in the improvement of instruction in the elementary curriculum and the secondary school content fields. *Credit, 3.* The Staff.

952 (213). Administering Elementary Schools.
The prinicipal's responsibilities, organization of the school office, scheduling, use of school facilities, curriculum organization, staff relationships, and the place of the school in the community.
Prerequisite, teaching experience. *Credit, 3.* The Staff.

953 (209). Administering Secondary Schools.
Housing, finance, schedule, the library, guidance, cafeteria, public relations, etc.
Prerequisite, teaching experience. *Credit, 3.* Mr. Griffiths.

954 (210). Administering Extra-Curricular Activities.
Scheduling, financing, sponsorship, regulation of pupil participation.
Prerequisite, teaching experience. *Credit. 3.*

955 (211). Community Relations for School Personnel.
The development of good public relations policies and the techniques of assisting lay people in interpreting school activities, policies, and objectives.
Prerequisite, consent of instructor. *Credit, 3.*

956 (220). School Laws of Massachusetts.
A review of the legal relations of school personnel covering experiences in school and community, presented in a series of selected cases.
Credit, 3. Mr. Purvis.

957 (219). Principles of School Law.
The legal basis of school operation, cases in school law, the role of the attorney general and school solicitor in school law interpretation, and school operation in relation to federal, state, and local environment.
Prerequisite, Education 950 (250). *Credit, 3.* Mr. Griffiths.

958 (226). School Personnel Administration.
The leadership role in staff performance and duties, planning and promotion of continuous programs of inservice training, recruitment and development of personnel, internal organization and administration.
Prerequisite, Education 950 (205). *Credit, 3.*

959 (224). School Business and Fiscal Affairs.
The theory and practice of school finance, taxation, and educational cost operation, budget planning and accounting, federal, state, and local aspects of school finance.
Prerequisite, Education 950 (205). *Credit, 3.*

960 (225). School Plant Planning.
Comprehensive study of school plant needs, site selection, bonding, building, planning and standards, architectural service, and furniture and equipment selection practices.
Prerequisite, Education 950 (205). *Credit, 3.* Mr. C. V. Jones.

961 (227). Case Studies in Educational Administration.
A series of situations involving the role of the school administrator in a democracy.
Prerequisites, Education 950 (205), 958 (226). *Credit, 3.* Mr. C. V. Jones.

962 (228). Educational Planning and Evaluation.
Participation in school survey to give advanced graduate students practical field experience in inspection, evaluation and recommendations for future action in the educational operation.
Prerequisites, Education 950 (205) and Education 959 (224), 960 (225) and instructor approval. Two consecutive semesters. *Credit, 6.* The Staff.

963 (229). Internship in Educational Administration.
Advanced graduate students in educational administration, as a part of advanced professional preparation, are placed on assignment in actual school administration positions on the basis of cooperative school system university selection, assignment and supervision.
Prerequisites, 18 semester hours in Educational Administration and permission of the instructor. *Credit, 6-12.* The Staff.

964 (212). Administration of Adult Education.
Role of the public schools in continuing community service, planning and directing programs in adult education, adult needs in preparation for job procurement, retraining, job advancement and community service.
Prerequisite, Education 950 (205). *Credit, 3.* Mr. Burkhardt.

991 (291). Research Methodology and Materials.
The methods of research pertinent to education, with consideration of influential factors. Principles involved in selecting and preparing research materials. Statistics are studied chiefly from the standpoint of reporting and understanding the results of research. *Credit., 3.* Mr. Rosemier.

994 (293). Research Design and Analysis.
Theory and techniques involved in analysis of various experimental designs pertinent to education, employing analysis of variance and covariance methods. Prerequisite, Education 991 (291). *Credit, 3.* Mr. Rosemier.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

510 (152). Principles and Methods of Teaching.
Credit, 3. Staff, Secondary Education.

511 (188). Secondary School Curriculum.
Credit, 3. Mr. Kornegay, Mr. Ratcliffe.

551 (151). History of Education.
Credit, 3. Mr. Angus, Mr. Eddy, Mr. Wellman.

560 (160). Elementary School Curriculum.
Credit, 3. Mr. Clegg, Mr. Fiorino.

561 (161). Elementary Reading and Language Arts.
Credit, 3. Miss O'Leary, Mr. Benz, Mr. Byrne.

562 (161). Elementary Arithmetic. *Credit, 3.* Mr. Hall.

564 (164). Principles of Elementary Education.
Credit, 3. Miss McManamy.

572 (172). Vocational Education in Agriculture. *Credit, 3.* Mr. Judge.

573 (173). Apprentice Teaching in Agriculture. *Credit, 6.* Mr. Judge.

575 (175). Technique of Teaching Vocational Agriculture.
Credit, 3. Mr. Judge.

653 (153). Educational Tests and Measurements. *Credit, 3.*

666 (166). Preparation and Use of Audiovisual Aids.
Credit, 3. Mr. Wyman, Mr. Sleeman.

677 (177). Principles of School Guidance. *Credit, 3.*

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Education except M.A.T. candidates)

685 (185). Observation and Practice Teaching. *Credit, 6.* The Staff.

ELECTRICAL ENGINEERING

GRADUATE FACULTY

Head of Department
G. D. Sheckels

Professors
J. W. Langford
C. S. Roys

Associate Professors
G. W. Bett
J. W. Mohn

Assistant Professors
H. A. Herchenreder
D. E. Scott

Requirements for the Master of Science degree in Electrical Engineering, in addition to those listed on page 22, are as follows:

1. Four required courses totaling 12 credits.
2. Four courses totaling a minimum of 12 credits selected from one of the three areas of interest: power systems, feedback control systems, or information processing. One minor elective course may be substituted for one of the four major courses. A maximum of eight credits of 100 series courses, and three credits of EE 200, may be included in the selection.
3. A minimum of six credits of research with an acceptable thesis.
4. No foreign language is required.
5. Supporting courses will be required for those students lacking the prerequisites specified on the following pages.

First Semester

EE 705 (205). Analysis of Linear Systems.	*Credit, 3.*
Physics 701 (201). Theoretical Physics.	*Credit, 3.*
Math 585 (175). Advanced Engineering Mathematics.	*Credit, 3.*
EE 800 (300). Research (Proposal).	*Credit, 0.*

Second Semester

EE 706 (206). Electromagnetic Field Theory.	*Credit, 3.*
EE 800 (300). Research.	*Credit, 6.*

Two courses each semester from one of the following three groups:

POWER SYSTEMS GROUP

First Semester

EE 677 (177). Principles of Switching Circuits I.	*Credit, 4.*
EE 686 (186). Power System Networks.	*Credit, 4.*
EE 711 (211). Power Transmission and Relaying.	*Credit, 3.*
EE 713 (213). Lightning Protection and Grounding.	*Credit, 3.*
EE 700 (200). Special Problems.	*Credit, 3.*

Second Semester

EE 678 (178). Principles of Switching Circuits II. *Credit, 4.*
EE 681 (181). Advanced Electrical Machinery. *Credit, 4.*
EE 690 (190). Feedback Control Systems. *Credit, 4.*
EE 712 (212). Symmetrical Components and System Stability. *Credit, 3.*
EE 700 (200). Special Problems. *Credit, 3.*

FEEDBACK CONTROL SYSTEM GROUP

First Semester

EE 731 (231). Linear Feedback Systems. *Credit, 3.*
EE 745 (245). Random Signals and Noise. *Credit, 3.*
EE 747 (247). Transistor Circuits. *Credit, 3.*
EE 700 (200). Special Problems. *Credit, 3.*

Second Semester

EE 681 (181). Advanced Electromechanical Energy Conversion. *Credit, 4.*
EE 688 (188). Pulse Circuits. *Credit, 4.*
EE 732 (232). Non-linear Feedback Systems. *Credit, 3.*
EE 700 (200). Special Problems. *Credit, 3.*

INFORMATION PROCESSING GROUP

First Semester

EE 707 (207). Advanced Microwave Engineering. *Credit, 4.*
EE 745 (245). Random Signals and Noise. *Credit, 3.*
EE 747 (247). Transistor Circuits. *Credit, 3.*
EE 700 (200). Special Problems. *Credit, 3.*

Second Semester

EE 690 (190). Feedback Control Systems. *Credit, 4.*
EE 694 (194). Microwave Engineering. *Credit, 4.*
EE 688 (188). Pulse Circuits. *Credit, 4.*
EE 748 (248). Network Analysis and Synthesis. *Credit, 3.*
EE 700 (200). Special Problems. *Credit, 3.*

MINOR ELECTIVE GROUP

First Semester

Math 521 (171). Vector Analysis. *Credit, 3.*
Math 621 (181). Complex Analysis. *Credit, 3.*
Math 551 (183). Numerical Analysis. *Credit, 3.*
Math 641 (193). Fourier Series and Orthogonal Functions. *Credit, 3.*

PHYSICS 567 (167). STATISTICAL MECHANICS AND INFORMATION THEORY. *Credit, 3.*

PHYSICS 711 (211). ELEMENTS OF QUANTUM THEORY. *Credit, 3.*

Second Semester

MATH 586 (176). ADVANCED ENGINEERING MATHEMATICS. *Credit, 3.*

PHYSICS 588 (188). SOLID STATE PHYSICS. *Credit, 3.*

In exceptional cases, the above programs may be modified at the suggestion or with the approval of the major adviser. Additional courses in each of the three areas of interest may be offered upon sufficient demand.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). SPECIAL PROBLEMS.
A study of recent advances and current problems in a specialized field of electrical engineering. Limited to three credits for degree candidates.
Prerequisite, consent of instructor. *Credit, 3.* The Staff.

705 (205). ANALYSIS OF LINEAR SYSTEMS.
Transient behavior of recurrent and distributed electrical, mechanical, acoustical, and heat-flow systems. Modern principles and methods of analysis basic to system synthesis.
Prerequisites, Electrical Engineering 252 (52) or equivalent.
Credit, 3. Mr. Fitzgerald and Mr. Roys.

706 (206). ELECTROMAGNETIC FIELD THEORY.
Microscopic and macroscopic properties of magnetic and insulating materials; gyromagnetism and the permeability tensor; reflection and refraction; skin effect; antenna analysis; relativistic electrodynamics.
Prerequisite, Electrical Engineering 257 (57) or equivalent.
Credit, 3. Mr. Mohn and Mr. Roys.

707 (207). ADVANCED MICROWAVE ENGINEERING.
Analysis of waveguides, gyrators, antennas and other microwave circuit elements; electron ballistics; ionospheric reflection and refraction, and the permittivity tensor; microwave generators; masers and lasers.
Three class hours; one 3-hour laboratory period.
Prerequisites, Electrical Engineering 294 (94) and 706 (206) or equivalent.
Credit, 4. Mr. Mohn and Mr. Roys.

711 (211). POWER TRANSMISSION AND RELAYING.
Electrical characteristics and equivalent circuits for transmission lines and cables. Protective relaying for transmission and distribution systems.
Prerequisite, Electrical Engineering 254 (54) or equivalent.
Credit, 3. Mr. Longley and Mr. Edwards.

712 (212). SYMMETRICAL COMPONENTS AND SYSTEM STABILITY.
The use of symmetrical components for the study of steady state and transient stability of transmission systems. Determination of stability by the step-by-step solution of the non-linear differential equations.
Prerequisite, Electrical Engineering 686 (186) or equivalent.
Credit, 3. Mr. Edwards and Mr. Longley.

713 (213). Lightning Protection and Grounding.
Electrical characteristics of lightning discharges, switching surges, lightning arresters, and insulating materials, and traveling waves on transmission systems. Methods of grounding and protection for overhead lines, cables, substation equipment and generating stations.
Prerequisite, Electrical Engineering 254 (54) or equivalent.
Credit, 3. Mr. Edwards and Mr. Longley.

731 (231). Linear Feedback Systems.
Analysis of linear feedback systems by Root-Locus, Nyquist and Nichols plots. Performance and stability of feedback systems in time and frequency domain by analytical and graphical methods.
Prerequisite, Electrical Engineering 290 (90) or equivalent.
Credit, 3. Mr. Bett, Mr. Herchenreder and Mr. Scott.

732 (232). Non-Linear Feedback Systems.
Analysis and synthesis of non-linear systems and systems with small non-linearities by Z-plane transforms, first harmonic approximations. phase-plane and Tsypkia loci for on-off controllers.
Prerequisite, Electrical Engineering 731 (231) or equivalent.
Credit, 3. Mr. Bett, Mr. Herchenreder and Mr. Scott.

745 (245). Random Signals and Noise.
Fundamental concepts of discrete and continuous probability theory. Averages, sampling, correlation coefficients and functions. Description of randomly varying signals in terms of their statistical properties. Statistical analysis of linear systems. Optimum filter synthesis.
Prerequisite, Electrical Engineering 252 (52) or equivalent.
Credit, 3. Mr. Herchenreder and Mr. Scott.

747 (247). Transistor Circuits.
Physical principles, characteristics, equivalent circuits and stability limitations. Performance critera determined with respect to temperature, time, frequency, circuit configuration, signal amplitude and wave-form.
Prerequisite, Electrical Engineering 256 (56) or equivalent.
Credit, 3. Mr. Langford and Mr. Mohn.

748 (248). Network Analysis and Sythesis.
Modern circuit theory with emphasis on synthesis. Brune, Darlington and other realization techniques. The approximation problem in time and frequency domains.
Prerequisite, Electrical Engineering 705 (205).
Credit, 3. Mr. Langford and Mr. Scott.

800 (300). Research.
An individual theoretical and/or experimental investigation or a design problem terminating with an acceptable thesis. The research proposal is to be approved at least five months before graduation. The research credit may be spread over several semesters.
Credit, 6. Mr. Bett, Mr. Langford, Mr. Roys, Mr. Sheckels, Mr. Herchenreder, Mr. Mohn and Mr. Scott.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major and minor credit)

677 (177). Principles of Switching Circuits.
Logical design of switching circuits with emphasis on the scientific methods available; the analysis and synthesis of switching systems using electromagnetic, electronic and solid state devices.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256 (56). *Credit, 4.* Mr. Edwards.

678 (178). Principles of Switching Circuits II.
Multiterminal and iterative circuits; circuit reliability; switching codes; alternative methods of sequential circuit design with emphasis on synchronous pulse circuits; trends in switching.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 677 (177). *Credit, 4.* Mr. Edwards.

585 (185). Electrical Measurements.
Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices.
Two class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 142 (42). *Credit, 3.* Mr. Laestadius.

681 (181). Advanced Electromechanical Energy Conversion.
Modern methods of analysis; Hamilton's Principle and Lagrange's Equations; matrices, dyadics and tensors; two reaction theory and symmetrical components; the generalized and special machines.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 254 (54). *Credit, 4.* Mr. Edwards and Mr. Roys.

686 (186). Power System Networks.
Power transfer diagrams, voltage studies, system stability criteria, short-circuit calculations and protective methods.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 252 (52).
Credit, 4. Mr. Edwards and Mr. Sheckels.

688 (188). Pulse Circuits.
Generation, transmission and processing of information by means of pulses, with applications to computers, communication, radar and television.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256 (56). *Credit, 4.* Mr. Langford.

690 (190). Feedback Control Systems I.
Analysis and design of error-sensitive control systems. Analytical and graphical determination of steady state and transient performance; applications to electrical, mechanical, and hydraulic systems.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 252 (52).
Credit, 4. Mr. Bett and Mr. Herchenreder.

694 (194). Microwave Engineering.
The fundamental principles of communications and electromagnetism and their application to the special problems of the generation, transmission, propagation and reception of microwaves.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 257 (57).
Credit, 4. Mr. Roys and Mr. Mohn.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Electrical Engineering)

579 (179). Communication Circuits.
Theory of lumped circuits and lines including matrices, positive real functions, and synthesis methods of Foster and Cauer.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 252 (52). *Credit, 4.* Mr. Langford and Mr. Scott.

580 (180). Electronics III.
Active circuits and communication theory covering tube and semiconductor circuitry with emphasis on aspects pertaining to information transmission.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256 (56).
Credit, 4. Mr. Langford and Mr. Mohn.

584 (184). Industrial Electronics and Control.
Industrial electronic devices and their characteristics; basic circuits and theory, application to commercial equipment.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 255 (55) or 262 (62).
Credit, 4. Mr. Roys.

585 (185). Electrical Measurements.
Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices.
Two class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 142 (42). *Credit, 3.* Mr. Laestadius.

ENGLISH

GRADUATE FACULTY

Head of Department
H. O. Brogan

Professors
T. W. Copeland
(Commonwealth Professor)
V. P. Helming
S. Kaplan
G. S. Koehler
J. Langland
W. G. O'Donnell
B. Spivack

Associate Professors
M. Campbell
J. Chametzky
D. R. Clark
A. R. Duckert
M. Golden
R. Haven
H.T. McCarthy
A. Page
A. J. Silver
J. C. Weston, Jr.

Assistant Professors
M. Halpern
J. H. Hicks
R. E. Kim
C. O. McDonald
L. Rabel
M. L. Ratner
S. Rudin
R. G. Tucker

All graduate students should secure from the Department of English detailed information on requirements for the degrees.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700 (200). Special Problems.
For students wishing to do special work not covered by courses listed in the curriculum. Permission must be secured from the head of the department and the instructor under whom the study will be done. The latter will supervise and evaluate the work. *Credit, 2-6.* The Department.

702 (201). Old English.
Introduction to Old English. *Credit, 3.* Miss Duckert.

703 (202). Middle English.
A study of the language and of documents representing the chief dialects. *Credit, 3.* Mr. Helming.

704. Structure of English.
Introduction to the methods of descriptive analysis of contemporary American English (sounds, forms, and syntax), with special emphasis on "standards of correctness." *Credit, 3.* Miss Rabel.

English 702, 703, or 704 is required of all candidates for the M.A. or Ph.D. degree.

705. Old English Literature.
Reading of various Old English works, but stressing *Béowulf*.
Prerequisite, English 702 (201), or equivalent. *Credit, 3.* Miss Duckert.

706. Middle English Literature.
Representative poems, verse plays, and selected prose, exclusive of Chaucer. Prerequisite, English 703 (202), or equivalent. *Credit, 3.* Mr. Helming.

721 (209). The Development of the English Novel.
Readings in the English novel to the late 19th century, from Richardson to Conrad, with special attention to some ten representative novels.
Credit, 3. Mr. Page.

730 (213). Literature of the 16th Century.
Christian and Humanist ideals reflected in the poetry of Wyatt, Surrey, Sackville, Raleigh, Sidney, and Spenser, stressing *The Fairie Queene.*
Credit, 3. Mr. McDonald.

734 (203). Elizabethan and Jacobean Drama.
Representative plays by Shakespeare's contemporaries, 1580-1642; special emphasis on works by Marlowe, Jonson, Beaumont and Fletcher, and Ford.
Credit, 3. Mr. Spivack.

737 (204). Literature of the 17th Century.
Readings in 17th century prose from Hobbes to Bunyan, and in poetry from Donne to Milton; analysis of the more significant areas of thought and style.
Credit, 3. Mr. Koehler.

740 (205). Literature of the Restoration and 18th Century.
Readings in English poetry and prose from Dryden to Burns, emphasizing the major writers and including representative plays. *Credit, 3.* Mr. Weston.

745 (206). Literature of the Romantic Period.
Readings in the major poetry, representative essays, and selected critical writings, including Blake, Coleridge, Wordsworth, Keats, Shelley, Byron, and Hazlitt. *Credit, 3.* Mr. Haven.

746 (207). Literature of the Victorian Age.
Readings in the chief poets and prophets of the Victorian age, with emphasis on Browning, Tennyson, Carlyle, Newman, Mill, Ruskin, Arnold, and Pater.
Credit, 3. Mr. Silver.

750. Colonial American Literature.
A study of the major writers and intellectual movements in America during the Colonial period. *Credit, 3.* Mr. Kaplan.

753 (208). American Romanticism.
The development of American romanticism, under European influence, stressing Cooper, Emerson, Thoreau, Hawthorne, Poe, and Melville.
Credit, 3. Mr. Kaplan.

755. American Realism.
The development of American realism from 1865 to 1914, stressing Twain, Henry James, Howells, and Henry Adams. *Credit, 3.* Mr. O'Donnell.

770 (210). Contemporary Drama.
Representative English, Irish, and American dramas since the 1890's, stressing major trends from realism to the theatre of the absurd. *Credit, 3.* Mr. Rudin.

771 (210). Contemporary Fiction.
Representative British and American novelists, emphasizing major trends, from Conrad to the present. *Credit, 3.* Mr. Chametzky.

772 (210). Contemporary Poetry.
The chief recent poets in English and their immediate forerunners, with brief attention to distinctive new voices and trends. *Credit, 3.* Mr. Langland.

780 (211). Imaginative Writing.
Writer's workshop, with emphasis upon poetry. May be repeated by candidates for the M.F.A. for a total of 6 credits. *Credit, 3.* Mr. Langland and Mr. Tucker.

781 (211). Imaginative Writing.
Writer's workshop, with emphasis upon fiction. May be repeated by M.F.A. candidates for a total of 6 credits. *Credit, 3.* Mr. Kim.

785 (245). Comparative Literature. *Credit, 3.* The Staff.

790. Folklore.
A study of folk narrative: tale, myth, and legend in relation to written literature. *Credit, 3.* Miss Campbell.

800 (300). Thesis, Master's Degree.
(For the M.F.A. degree this course may be repeated for a total of 12 credits.) *Credit, 3-9.*

870 (232). Seminar in English Literature. *Credit, 3.* The Staff.

871 (233). Seminar in the English Language. *Credit, 3.* The Staff.

872 (231). Seminar in American Literature. *Credit, 3.* The Staff.

873 (240). Seminar in Criticism. *Credit, 3.* The Staff.

874 (241). Seminar in Editing. *Credit, 3.* The Staff.

875 (242). Seminar in Writing. *Credit, 3.* The Staff.

876 (243). Seminar in Linguistics. *Credit, 3.* The Staff.

877 (230). Seminar in Comparative Literature. *Credit, 3.* The Staff.

900 (400). Thesis, Doctoral Degree. *Credit, 15-30.*

COURSES PRIMARILY FOR MINOR CREDIT AND FOR SECONDARY TEACHERS SEEKING THE M.A.

505 (172). Greek Literature in Translation.
Homer, lyric poetry, the major dramatists, selected dialogues of Plato, Thucydides, and their relations to the classical tradition in English literature. *Credit, 3.* Mr. McDonald.

521 (167). Shakespeare.
The dramatic art of Shakespeare as revealed in a study of approximately twenty plays.
Credit, 3. Mr. Spivack, Mr. O'Donnell, Mr. McDonald, Mr. Sweeney, and Mr. Wolf.

525 (175). English Literature of the Restoration.
A study of approximately twenty works illustrating themes and techniques of Restoration comedy, sentimental drama, and the heroic play, with emphasis on Dryden, Wycherley, Congreve and Sheridan. *Credits, 3.* Mr. Barron and Mrs. Hogan.

536 (174). Milton.
Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance, with emphasis on *Paradise Lost.* *Credit, 3.* Mr. Koehler and Mr. Collins.

542 (178). English Literature of the Eighteenth Century.
The literature of the later 18th century with special emphasis on the Johnson Circle. *Credit, 3.* Mr. Copeland, Mr. Golden, and Mr. Weston.

563 (190). Modern British and American Drama.
A study of representative dramatists since the late 19th century, including Shaw, Fry, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art. *Credit, 3.* Mr. Rudin.

564 (185). Modern European Drama (in translation).
Major modern dramatists beginning with Ibsen, and including Chekhov, Pirandello, Strindberg, Giraudoux, Shaw, and others. Emphasis on comparative currents in various European nations. *Credit, 3.* Mr. Rudin, Mrs. Hogan, and Mr. Halpern.

566 (189). Modern Poetry.
An analysis of twentieth-century poetry developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson to those of the present. *Credit, 3.* Mr. Koehler, Mr. Clark, Mr. Langland, Mr. Barron, Miss Horrigan, and Mr. Tucker.

575 (157). Major American Writers.
Selected major American writers of the 19th and 20th centuries, including Emerson, Hawthorne, Longfellow, Lowell, James, Adams, Fitzgerald, and Hemingway. *Credit, 3.* Mr. O'Donnell, Mr. Kaplan, Mr. A. Williams, Mr. McCarthy, Mr. Chametzky, Mr. Rudin, and Mr. Gozzi.

576 (158). Major American Writers.
Selected major American writers of the 19th and 20th centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Crane, Dreiser, Wolfe, and Faulkner. *Credit, 3.* Mr. Kaplan, Mr. O'Donnell, Mr. A. Williams, Mr. Halpern, Mr. McCarthy, and Mr. Gozzi.

580. Introduction to Folklore.
An exploration of the subject, beginning with the ballad as the nucleus of other folklore genres. *Credit, 3.* Miss Campbell.

585 (163). Literary Criticism.
An introduction to literary criticism; chief emphasis on the major philosophical critics beginning with Plato and Aristotle. *Credit 3.* Mr. Copeland.

ENTOMOLOGY AND PLANT PATHOLOGY

GRADUATE FACULTY

Head of Department
J. H. Lilly

Professors
C. J. Gilgut
J. F. Hanson
J. A. Naegele
F. R. Shaw
H. L. Sweetman
W. E. Tomlinson, Jr.
W. D. Tunis
E. H. Wheeler
B. M. Zuckerman

Associate Professors
W. M. Banfield
W. B. Becker
F. W. Holmes
R. A. Rohde
M. E. Smith

Assistant Professors
R. E. Inman
H. E. Wave

Entomology

Requirements for the M.S. degree in Entomology include completion of a thesis and demonstration of a reading knowledge of one foreign language. Also each candidate must take or have had Entomology 150 (35), 655 (155), 656 (156) and 657 (157) or their equivalents, plus a minimum of eleven additional graduate credits in Entomology, including the six credits in graduate level courses that are required by the Graduate School.

Requirements for the Ph.D. degree include those established by the Graduate School, plus any additional ones specified by the student's Guidance Committee.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

(Most graduate level courses in the department are given on a rotating basis, subject to change on student demand.)

700 (200). Special Problems.
Selected research problems in entomology. *Credit, 1-5,* The Staff.

705 (205). Principles of Plant Protection.
Fundamentals of insecticidal action, natural factors governing insect abundance and activity, infection and disease development, chemical control, cultural practices, quarantine and eradication, host resistance and pathogen variability and weed control. Offered only at the Waltham Field Station.
Credit, 3. The Staff.

745 (245). Historical Entomology.
Lives and works of outstanding entomologists of the world; history of entomology.
Prerequisite, permission of instructor. *Credit, 2* Mr. Lilly.

770 (270). Research Methods.
An orientation course for incoming graduate students which stresses research principles, methods of analysis, and presentation of results.
Credit, 3. Mr. Sweetman.

790 (280). Seminar.
Reports on the current literature of entomology; special reports by resident and visiting speakers.
One class hour. (Maximum for M.S. Candidates, 2)
(Maximum for Ph.D. Candidates, 4)
Credit, 1 each semester. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

803 (203). Insect Embryology.
The embryological development of a generalized type of insect, after which specific insects are considered. Lectures, assigned readings, laboratory work.
Prerequisite, Entomology 657 (157). *Credit, 2.* Mr. Shaw.

811 (211). Insect Behavior.
The honey bee as a type for the study of behavior; interpretations of the reasons for the actions of this insect. Other species may be included for completeness.
Prerequisites, Entomology 126 (26) and 566 (166) or equivalent.
Credit, 3. Mr. Shaw.

814 (214). Advanced Animal Ecology.
Basic principles of terrestrial, limnological, and marine ecology, with special emphasis on the influence of causal factors, both physical and biotic, that regulate the activities of all organisms.
Prerequisite, Entamology 579 (179) or equivalent.
Credit, 3. Mr. Sweetman.

821 (221). Insect Toxicology.
The chemistry of insecticides and their physiological effects on insects, man and other animals.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Wave.

823 (223). Advanced Biological Control.
The basic fundamental principles, as well as practical application of biological control of insects. A section is devoted to control of pest weeds with insects.
Prerequisite, Entomology 680 (180) or equivalent. *Credit, 3.* Mr. Sweetman.

842 (242). Advanced Arthropod Taxonomy.
Classification of selected insects and insect allies, including latest methods in taxonomy and principles of classification.
Prerequisite, permission of instructor. *Credit, 1-9.* The Staff.

A.	Culicidae	Miss Smith
B.	Immature stages of insects	Miss Smith
C.	Ticks	Mr. Shaw
D.	Siphonaptera	Mr. Shaw
E.	Simuliidae	Mr. Shaw
F.	Minor orders of insects	Mr. Hanson
G.	Arthropods other than insects	Mr. Hanson
H.	Other groups of insects	The Staff

848 (248). Principles of Systematic Entomology.
The species concept; type categories; the Zoological Code. The preparation of a taxonomic paper of publication quality, including drawing, required.
Prerequisites, Entomology 655 (155), 656 (156) *Credit, 3.* Mr. Hanson.

850 (250). Advanced Medical Entomology.

Detailed studies of insects as parasites of man and animals. Biology, vector-relationship, taxonomy and control.
Prerequisite, Entomology 674 (174) or equivalent. *Credit, 3.* Mr. Shaw.

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

572 (172). Forest and Shade Tree Insects.
The principles and methods of controlling insects which attack shade trees, forests and forest products. A study of the more important species, their identification, biology, and specific control measures.
Two class hours, two 2-hour laboratory periods. *Credit, 4.* Mr. Hanson.

579 (179). Animal Ecology.
The relation of animals to their environment, covering such physical factors as temperature, moisture, light, etc., and biotic factors as neighbors, competitors, predators, etc. Actual measurements of environmental factors and responses of animals in the field and laboratory.
Two class hours, one 2-hour laboratory period.
Prerequisite, Entomology 126 (26) or a course in Zoology.
Credit, 3. Mr. Sweetman.

590 (190). Evolution.
A course in orientation. Lectures consider evolution of both organic and inorganic matter with attention to the evolution of human behavior and to the effect of evolutionary concepts on human philosophy. Extra supplementary reading required of graduate students. *Credit, 3.* Mr. Hanson.

655, 656 (155, 156). Classification of Insects.
The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; second semester; other orders. Either semester may be elected independently.
Three 2-hour laboratory periods.
Prerequisite, Entomology 126 (26); Entomology 657 (157) recommended.
Credit, 3. Miss Smith.

657 (157). Insect Morphology.
The external and internal anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology of insects.
One class hour, three 2-hour laboratory periods.
Prerequisite, Entomology 126 (26). *Credit, 4.* Mr. Hanson.

674 (174). Medical and Veterinary Entomology.
Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests.
One class hour, two 2-hour laboratory periods.
Prerequisite, Entomology 126 (26). *Credit, 3.* Mr. Shaw.

680 (180). Insect Control.
The scientific basis of insect control, considered from the chemical, biological, ecological, mechanical, and legislative approaches. Special emphasis on the composition, manufacture, preparation, and reaction of insecticides, and the use of resistant hosts, microorganisms and the larger parasites and predators.
Prerequisites, Entomology 150 (35), 655 (155), and 657 (157).
Credit, 3. Mr. Sweetman.

682 (181). Insect Physiology.
Detailed consideration is given to the organ systems, showing the functions such as nutrition, respiration, and growth, and the relationship of physiology to behavior.
One class hour, two 2-hour laboratory periods.
Prerequisites, Entomology 126 (26) and Introductory Physiology, Zoology 135 (35). *Credit, 3.* Mr. Wave.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Entomology)

560 (160). Structural Pest Control.
Methods of combating insect and rodent pests, with emphasis on the control of those pests attacking buildings and other structures, foods, fabrics, and other stored products in homes or other establishments.
Two class hours, one 2-hour laboratory period.
Prerequisite, a course in Zoology; Entomology 126 (26) desirable.
Credit, 3. Mr. Sweetman.

566 (166). Beekeeping.
Honeybees and their relatives; structure and biology of bees; bee management, diseases, queen rearing, and honey production; history of apiculture.
Two class hours, One 2-hour laboratory period.
Prerequisite, Entomology 126 (26) or a course in Zoology.
Credit, 3. Mr. Shaw.

Plant Pathology
Mr. Banfield and Mr. Rohde, major advisers.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems.
Selected research problems in plant pathology. *Credit, 1-5.* The Staff.

800 (300). THESIS, MASTER'S DEGREE. *Credit, 10.*

804 (204). FOREST PATHOLOGY.
The diseases of trees and the decay of forest products.
Prerequisites, Plant Pathology 551 (151) and Mycology, Botany 531 (166). *Credit, 3.* Mr. Banfield.

805, 806 (205, 206). ADVANCED PLANT PATHOLOGY.
The biological problems that underlie the diseased state. 805. The principles of plant infections, the interactions of host, parasite, and environment in the rise and decline of devastating epiphytotics. 806. The mechanisms that govern disease disposition, disease resistance and immunity.
Prerequisites, Mycology, Botany 531 (166) and 1 year of Plant Pathology. *Credit, 2-4 each semester.* Mr. Banfield.

900 (400). THESIS, PH.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

551 (151). PLANT PATHOLOGY.
The nature, causes and control of plant diseases.
Prerequisite, a course in Botany. *Credit, 3.* Mr. Agrios.

569 (169). FOREST AND SHADE TREE PATHOLOGY.
The nature, cause and control of the principal types of disease in trees including decay of forest products, standing and structural timber. *Credit, 3.* Mr. Banfield.

575 (175). METHODS IN PLANT PATHOLOGY.
General techniques and specialized methods used in the investigation of plant diseases.
Prerequisite, one semester of Plant Pathology. *Credit, 3.* The Staff.

678 (178). NEMATOLOGY.
Anatomy, morphology and classification of plant-parasitic and other soil-inhabiting nematodes. Parasitic relationships with plants and current control measures will be stressed.
Prerequisite, a year of biological science. *Credit, 3.* Mr. Rohde.

690 (190). INSECT TRANSMISSION OF PLANT DISEASES.
Lectures on intricate interrelationships of insects, plants, and microorganisms, with particular emphasis on the basic role played by insects in inception, distribution and perpetuation of plant diseases. *Credit, 3.* Mr. Banfield

FOOD SCIENCE AND TECHNOLOGY

Head of Department: W. B. Esselen

Professors
- I. S. Fagerson
- F. J. Francis
- D. J. Hankinson
- K. M. Hayes (Extension)
- A. S. Levine
- D. E. Lundberg

FOOD SCIENCE AND TECHNOLOGY

Associate Professors
H. O. Hultin
W. W. Nawar
F. E. Potter
F. M. Sawyer
C. R. Stumbo

Assistant Professors
W. M. Hunting
R. E. Levin

INSTITUTE OF AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY

Director and Commonwealth Professor
W. Litsky

Associate Professor
W. S. Mueller

Assistant Professor
H. B. Gunner

Research Instructor
R. W. Walker

Graduate students who wish to major in Food Science and Technology may not be admitted to candidacy for an advanced degree until such time as the undergraduate requirements in basic sciences and department courses have been met substantially. Work in the area of Dairy Technology is included in the offerings of the Department of Food Science and Technology.

Industrial Microbiology is offered as an area of concentration for the Ph.D. degree in the Department of Food Science and Technology in cooperation with the Institute of Agricultural and Industrial Microbiology.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Research Problem.
Mainly for candidates for the Master of Science degree who do not write a thesis. Original research expected. Two bound copies of a written report of the study are required by the department. *Credit, 3-6.* The Staff.

703 (203). Research Project.
Research on problems not related to the thesis. For Ph.D. candidates only.
Credit, 1-4. The Staff.

802 (202). Advanced Dairy Chemistry.
The physical, colloidal, and chemical properties of dairy products and the role of milk fat, salts, proteins, carbohydrates, and enzyme systems.
Two class hours, one 3-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Potter.

809 (209). Sporology and Thermoprocessing I.
Biological Aspects. Fundamentals of thermal preservation of foods. Microbiological spoilage and intoxication with emphasis on sporogenous bacteria. Biology of bacterial endospores; their taxonomy, morphology, cytology, metabolism and germination. Thermobacteriology as applied in calculation and evaluation of sterilization processes.
Three class hours.
Prerequisites, Food processing, basic microbiology, biochemistry, calculus and consent of instructor. *Credit, 3.* Mr. Stumbo.

810 (210). Sporology and Thermoprocessing II.
Physical Aspects. Heat transfer in thermally processed foods. Theoretical computation of the thermal process. Thermoprocessing and food quality. Alternative and complimentary means to thermoprocessing; ionizing radiation, chemical vaporphase sterilization, etc.
One class hour, one 4-hour laboratory period.
Prerequisites, Food Science and Technology 809 (209) and consent of instructor. *Credit, 3.* Mr. Stumbo.

816 (216). Food Packaging.
Characteristics of packaging materials and how they meet the package requirements of various food products. Methods of testing for structural quality and performance including moisture and gas transmission. Consideration of adhesives, lacquers and closures. Plant visits in non-scheduled hours.
One or more class hours, one 4-hour laboratory period.
Prerequisites, Food Science and Technology 662 (162).
Credit, 3. Mr. Levine.

821 (221). Lipid Chemistry.
Composition and chemical properties of edible fats and oils. Physical characteristics — plasticity, polymorphism, melting, solidification. Technology of industrial fats — extraction, refining, hydrogenation, interesterification. Deteriorative reactions — oxidation, thermal degradation. Biological significance. New methods of analysis. Review of current literature.
Two class hours, one 2-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Nawar.

841 (241). Advanced Food Analysis.
Physical and chemical means of expressing quality of a product. Application of analytical instrumental methods including paper and gas chromatography, infrared spectrophotometry, radioactive tracer techniques, etc.
One class hour, one conference.
Prerequisites, Food Science and Technology 672 (192) and 684 (194).
Credit, 3. Mr. Fagerson.

850 (250). Food Colorimetry.
Physics of color measurement and theories of vision. Interpretation of reflection and transmission colorimetric data in terms of Munsell, C. I. E., Hunter, Adams and other color solids, color tolerances, and small color differences. Interpretation of color changes in terms of the properties of food pigments and colorants and their importance in food science.
Two class hours, one 3-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Francis.

871 (271), 872 (272). Seminar.
Review of current literature and research. Visiting lecturers.
One class hour. Maximum credit, 6. *Credit, 1.* The Staff.

895 (295). Biological and Toxicological Assay of Foods.
Laboratory training in making biological assays of food constituents important in human and animal nutrition. Added chemicals in foods.
Prerequisites, Chemistry 684 (194) and Food Science and Technology 672 (192). *Credit, 2-5.* Mr. Sawyer.

800 (300). Thesis, Master's Degree. *Credit, 10.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

658 (158). Animal Products.
Preparation, processing, packaging and marketing of animal products.
One class hour, one 4-hour laboratory period. *Credit, 3.* Mr. Buck, Mr. Denison.

661, 662 (161, 162). Industrial Technology.
A survey of commercial principles in the manufacture and preservation of food products. Includes individual research projects.
One class hour, one 4-hour laboratory period.
Prerequisites, Food Science and Technology 551 (151).
Credit, 3 each semester. Mr. Levine.

665 (165). Unit Operations.
Technical principles involved in the handling and processing of milk and dairy products.
Two class hours, one 4-hour laboratory period. *Credit, 4,* Mr. Potter.

666 (166). Quality Control and Standards.
Relationship of composition, handling, processing, storage and market regulations to the bacteriological and chemical quality of milk and its products.
Two class hours, two 2-hour laboratory periods. *Credit, 4.* Mr. Evans.

671, 672 (191, 192). Analysis of Food Products.
Physical, chemical, microbiological and microscopical methods will be employed. Federal and State food regulations are considered.
Two class hours, one 4-hour laboratory period.
Prerequisites, Chemistry 210 (32) and Food Science and Technology 551 (151) or 575 (175). *Credit, 3 each semester.* Mr. Hunting.

684 (194), Sensory Evaluation Methods.
An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretation; taste, odor, color, and texture measurements.
One class hour, one 2-hour laboratory period. *Credit, 2.* Mr. Sawyer.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Food Science and Technology)

551 (151). INTRODUCTORY FOOD SCIENCE.
A basic course, primarily for department majors, covering food manufacture, processing, distribution and spoilage problems.
Two class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Esselen.

552 (152). FOOD CHEMISTRY.
Composition of food products. Changes that occur in the chemistry of foods during storage and processing. Enzymes in the food industry.
Two class hours, one 4-hour laboratory period alternate weeks.
Prerequisites, Food Science and Technology 551 (151).
Credit, 3. Mr. Hultin.

575 (175). PRINCIPLES OF FOOD TECHNOLOGY.
Intended only for those who desire a survey of the field. Not open to Food Science and Technology majors.
Two class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Esselen.

FORESTRY AND WOOD TECHNOLOGY

GRADUATE FACULTY

Head of Department
A. D. Rhodes

Professors
E. Bennett
H. B. Gatslick
W. P. MacConnell

Associate Professors
D. L. Mader
A. J. W. Scheffey
A. H. Westing

Assistant Professors
H. G. Abbott
R. B. Hoadley

Applicants for admission who plan to major in forestry or wood technology customarily should have completed an undergraduate major in one of these fields. An exception may be made in the case of individuals having a strong background in a related discipline or the basic sciences. Candidates for a Master's degree majoring in forestry or wood technology orinarily must complete a thesis; exceptions will be made in unusual circumstances. Emphasis may be in the area of forest soils, forest ecology, silviculture, resource management, resource economics, forest products, marketing or wood technology.

Facilities for instruction and research include the newly constructed and well equipped Holdsworth Natural Resources Center, a sawmill, dry kiln, and several thousand acres of University-owned and other available forest land within ten miles of the campus.

Although the Department does not offer the Ph.D. degree, it is possible by cooperative arrangement with other departments such as Botany and Agronomy for the student to receive his doctorate in one of these departments based on a thesis project carried out in some phase of forestry.

FORESTRY

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Project.
Selected research problem in forestry not related to the candidate's thesis.
Credit, 2-4. The Staff.

701 (201). Advanced Forest Soils.
The relation of soils to tree growth and other environmental factors with particular emphasis on research methods, site evaluation, water relationships, and fertility; laboratory and field exercises.
Prerequisite, Forestry 524 (154) or equivalent. *Credit, 3.* Mr. Mader.

702 (202). Aerial Photo-Interpretation.
Advanced aerial photo-interpretation emphasizing the analysis of natural vegetation, especially forest vegetation; a wide selection of aerial photographs is available for interpretive study and cartography.
Prerequisite, Forestry 531 (171) or equivalent. *Credit, 3.* Mr. MacConnell.

703 (203). Advanced Forest Ecology.
Research methods and instrumentation in forest ecology; forest influences with special emphasis on the effect of micro-climate on site quality and the management of watersheds.
Prerequisite, Forestry 523 (153) or equivalent. *Credit, 3.* Mr. Mader.

704 (204). Advanced Silviculture.
Growth and reproductive characteristics and requirements of trees and forest stands as they affect silvicultural management, particularly in relation to thinning and the establishment of forest regeneration.
Prerequisites, Forestry 523 (153), 524 (154) and 526 (156) or equivalents.
Credit, 3. Mr. Rhodes.

705 (205). Research Concepts in Forest Biology.
A study of the development of biological knowledge relating to forestry from both the historical and philosophical points of view with special emphasis on contributions of contemporaneous scientific research. Given in alternate years.
Credit, 3. Mr. Abbott.

706 (206). Advanced Forest Mensuration.
Regression analysis applied to stand and tree volume determination, stand growth and yield, forest site evaluation, and related measurement problems. Computer techniques will be used to solve some of the computational problems.
Prerequisites, Forestry 525 (155) and 534 (184) or equivalents.
Credit, 3. Mr. Mawson.

707 (207). Advanced Forest Management.
Economic evaluation of forest enterprises; appraisal of rates of return, damage, and stumpage values.
Prerequisite, Forestry 540 (180) or equivalent. *Credit, 3.* Mr. MacConnell.

708 (208). Micro-Economics of Forestry I.
Principles of micro-economics as applied to forestry problems with special emphasis on marginal analysis in regard to land, labor, and capital.
Prerequisite, Forestry 535 (157) or equivalent. *Credit, 3.* Mr. Bond.

709 (209). Micro-Economics of Forestry II.
A continuation of Forestry 708 (208) with emphasis on supply and demand, marketing, taxation, and social problems in relation to the forest economy.
Credit, 3. Mr. Bond.

791. Seminar.
Specialized study in a selected area of forestry. *Credit, 1-3.* The Staff.

800 (300). Thesis, Master's Degree. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

521. Timber Harvest and Conversion.
Timber harvesting, milling techniques, and markets; field trip of one week duration to observe these processes in major wood industries.
Four 40-hour weeks in the summer.
Credit, 4. Mr. Bond and Mr. MacConnell.

523 (153). Silvics.
Forest ecology as a foundation for silviculture; environmental factors and their effect upon vegetation; development and classification of trees and forest communities; forest influences. *Credit, 3.* Mr. Mader.

524 (154). Forest Soils.
Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and range management; forest soil description, classification and mapping.
Prerequisite, Soil Science 105. *Credit, 3.* Mr. Mader.

525 (155). The Elements of Forest Mensuration.
The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data. Given each summer, and in alternate years the first semester.
Credit, 3. Mr. Mawson and Mr. MacConnell.

526 (156). The Principles of Silviculture.
Forest culture of wood crops; regeneration and intermediate cuttings, silvicides, prescribed burning, site treatment, slash disposal, nursery management, forest planting and direct seeding.
Prerequisite, Forestry 523 (153) recommended.
Credit, 4. Mr. Rhodes and Mr. Abbott.

529 (159). Forest Protection.
Principles of protecting forests from fire, insects, diseases, domestic animals, wildlife, and atmospheric agencies with special emphasis on the prevention and control of forest fires. *Credit, 3.* Mr. Abbott.

531 (171). Aerial Photogrammetry.
Principles of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces. Photographic interpretation and map making from aerial photographs. *Credit, 3.* Mr. MacConnell.

532. Forest Tree Improvement.
Tree introduction, geographic variation, tree selection, vegetative propagation, controlled pollination and hybridization, seed orchard management.
Credit, 3. Mr. Abbott.

534 (184). Forest Survey and Sampling Design.
The theory and application of sampling techniques in forest survey and research problems including simple random, stratified, sub-sampling, representative, and probability sampling. *Credit, 3.* Mr. Mawson.

535. Forest Economics.
The application of economic principles to the allocation of land, labor and capital in forest enterprises; market and pricing theory of forest products. Prerequisite, Introductory Economics. *Credit, 3.* Mr. Bond.

536. Forest Resources Policy.
Forest policy in the United States: history of policy development; factors affecting forest resources management; forest taxation, credit, insurance, and resource planning. *Credit, 3.* Mr. Bond.

540 (180). Principles of Forest Management.
Multiple-use management of forest land, organization of the forest for sustained-yield management. Preparation of a management plan for a 10,000-acre forest. Laboratory period optional for non-forestry majors.
Prerequisite for the laboratory, Forestry 525 (155).
Credit, 3-5. Mr. MacConnell.

WOOD TECHNOLOGY

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. Special Project.
Selected research problem in wood technology not related to the candidate's thesis. *Credit, 2-4.* The Staff.

710 (210). Chemical Modification of Wood.
Basic concepts and techniques concerning the chemical modification of wood; the potential and limitations of physical and chemical treatments as they affect the dimensional stability and durability of wood.
Prerequisites, Organic Chemistry and Forestry 504 (152).
Credit, 3. The Staff.

792. Seminar.
Specialized study in a selected segment of wood products marketing or wood technology. *Credit, 1-3.* The Staff.

800. Thesis, Master's Degree. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

501. Wood Anatomy and Identification.
A basic anatomical study of wood elements, their various structural characteristics and function; identification of woods. *Credit, 3.* Mr. Hoadley.

502. Primary Timber Conversion. (1965-66)
Survey of operations, principally sawmilling, in primary conversion of logs into lumber and allied by-products; drying, grading, handling and market distribution of sawmill products. Not open to students in forest management except by special permission. *Credit, 3.* Mr. Hoadley.

503 (175). Forest Products.
A survey of the principal forest products, their manufacture and distribution. *Credit, 3.* Mr. Gatslick.

504 (152). Properties of Wood. (1966-67)
The physical and chemical characteristics of wood in relation to its use; the influence of growth upon wood properties; methods of testing. *Credit, 3.* Mr. Hoadley.

506. Wood Machinery Theory and Practice. (1965-66)
Fundamental principles of knife and saw-tooth action as applied to problems of severing, surfacing, and shaping; general survey of commercial wood machining equipment.
Prerequisites, Forestry 501 and 504. *Credit, 3.* Mr. Hoadley.

508 (185). Wood Seasoning and Preservation. (1966-67)
Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment. *Credit, 3.* Mr. Gatslick.

510. Wood Coating and Adhesive Technology. (1965-66)
Basic concepts and applied techniques in wood substrate surface modification and bonding to include materials and methods in finishing and gluing wood and fibrous composites.
Prerequisites, Organic Chemistry, Forestry 501 and 504. *Credit, 3.* Mr. Gatslick.

GEOLOGY

GRADUATE FACULTY

Head of Department
H. T. U. Smith

Professor
O. C. Farquhar

Associate Professors
W. S. Motts
G. W. Webb

Assistant Professors
G. E. McGill
C. W. Pitrat
P. Robinson

Instructor
M. O. Hayes

Requirements for the M.S. degree are as follows:

1. A minimum of 60 credits in geology, including both undergraduate and graduate work.

2. Courses in related sciences comparable to those required for undergraduate majors: one year each of chemistry and physics, one semester of approved biologic science and mathematics through calculus.
3. Proficiency in technical writing.
4. At least six weeks of training in field geology.
5. Graduate credits in geology as required by the Graduate School.
6. A qualifying examination on knowledge of general geology, including field and laboratory techniques and sources of geologic information.
7. A thesis based at least in part on field study, and representing an original contribution to geologic knowledge.
8. A final examination, emphasizing defense of the thesis, together with a more advanced knowledge of the field or fields which represent background for the thesis.

At the beginning of the first semester in residence, new graduate students are given placement interviews covering prior training and fields of their geologic interests. These interviews provide a partial basis for planning the student's course of study.

Requirements for the Ph.D. degree, in addition to general requirements of the Graduate School, are as follows:

1. Ordinarily the doctoral candidate is assumed to have received the Master's degree or equivalent training; however, selected students with outstanding records may be accepted provisionally with the Bachelor's degree only, and proceed more directly toward meeting doctoral requirements.
2. Basic training in physics, chemistry, mathematics, and biology, and additional work in at least one of these fields.
3. At least 6 months of approved field training and experience.
4. A broad knowledge of fundamental concepts, methods of investigation, and historical development of geologic science.
5. Mastery of an elected field or fields of specialization.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems.
Either or both of the following options may be selected:
A. Independent study—guided reading and/or laboratory study in subjects or techniques not covered by other courses in the department.
B. Research—original library, field, and/or laboratory investigation of a selected problem.
Prerequisites, 45 credits in geology and consent of department head and of instructor concerned. *Credit, 2-6.* The Staff.

712 (202). Advanced Mineralogy.
Physical and chemical characteristics of minerals and methods of laboratory investigation, including X-ray, differential thermal analysis, and microchemical techniques.
Prerequisites, Geology 611 (201) and permission of instructors.
Credit, 3. The Staff

716 (250). Geochemistry.
Principles of geochemistry and interpretation of geochemical data in relation to geological processes and to the origin and history of the earth.
Prerequisites, Geology 110 (42) 520 (156), one year year of college chemistry and permission of instructor. *Credit, 2.* Mr. Nelson.

722 (203). Igneous Petrology.
Description, classification, origin, and alteration of igneous rocks. Examination of rocks in hand specimen and in thin section under the microscope.
1963-64 and each alternate year.
Prerequisites, Geology 520 (156) 611 (181). *Credit, 3.* Mr. Robinson.

723 (205). Sedimentary Petrology.
Description, classification, and origin of sedimentary rocks; laboratory study of structure, texture, and composition using the microscope and other analytical techniques.
Prerequisites, Geology 611 (181) and 550 (174). *Credit, 2.* Mr. Hayes.

724 (206). Metamorphic Petrology.
Description, classification and origin of metamorphic rocks. Microscopic study of suites of thin sections.
1964-65 and each alternate year.
Prerequisites, Geology 520 (156) and 611 (181). *Credit, 3.* Mr. Robinson.

732 (236). Advanced Structural Geology.
Dynamics and mechanics of rock deformation, including theoretical and experimental studies, with field applications.
Prerequisites, Geology 130 (33) and 531 (172). *Credit, 3.* Mr. McGill.

735 (234). Regional Geology of North America.
Tectonic concepts as exemplified by the stratigraphic and structural evolution of North America.
Prerequisites, Geology 102 (2) and 130 (33). *Credit, 3.* Mr. McGill.

741 (220). Stratigraphic Paleontology.
Application of selected fossils and faunal assemblages to stratigraphic correlation, and paleoecological and paleogeographic analysis, with reference to evolutionary trends.
Prerequisites, Geology 540 (163) and 645 (178). *Credit, 3.* Mr. Pitrat.

751 (212). Sedimentation.
A critical analysis of modes of origin of the several types of sedimentary rocks.
Prerequisites, Geology 550 (174) and 645 (178). *Credit, 3.* Mr. Hayes.

752 (227). Marine Geology.
Physical characteristics and geological processes of the ocean basins and margins, and their bearing on interpretation of geologic history.
Prerequisites, Geology 645 (178) and 666 (194). *Credit, 3.* Mr. Webb.

756 (242). Coastal Processes.
Erosional, transportational, and depositional phenomena, including organic processes, of the various types of coastal environments, their relation to geologic, geomorphic, and oceanographic factors, and their significance in stratigraphic interpretation and in other fields.
Prerequisites, Geology 645 (178), 655 (180), and 660 (189), or permission of instructor. *Credit, 2.* Mr. Hayes.

761 (228). Map Interpretation.
A laboratory study of the various types of maps used by geologists, with special reference to the identification and interpretation of landforms and structures.
Prerequisites, Geology 660 (189). *Credit, 2.* Mr. Smith.

762 (230). Advanced Geomorphology.
A critical study of selected topics and current problems in geomorphology.
Prerequisite, Geology 660 (189). *Credit, 2.* Mr. Smith.

769 (238). Advanced Photogeology.
A laboratory study of surface expression as a key to subsurface phenomena as illustrated by specific areas.
Prerequisites, Geology 660 (189), and 668 (191). *Credit, 2.* Mr. Smith.

782 (214). Petroleum Geology.
Geologic occurrence of oil and gas. Laboratory work consists of problems related to reservoir and trap conditions and to methods of subsurface study.
Prerequisites, Geology 130 (33), 110 (42) and 645 (178); 735 (234) desirable. *Credit, 3.* Mr. Webb.

783 (216). Metalliferous Economic Geology.
Nature, origin, and distribution of metalliferous ores. Criteria for recognition of ore deposits, changes in character of ore with depth, mineral associations, and types of wallrock alteration. Optical and microchemical properties of ore minerals and ore concentrates.
Given in alternate years.
Prerequisites, Geology 130 (33), 110 (42) and 520 (156); 722 (203) desirable. *Credit, 3.* Mr. Farquhar.

784 (217). Non-metalliferous Economic Geology.
Geology, distribution, and utilization of non-metallic mineral deposits, including coal and other solid hydrocarbons.
Given in alternate years.
Prerequisites, Geology 130 (33), 110 (42), 520 (156), 645 (178) and 611 (181). *Credit, 3.* Mr. Farquhar.

786 (218). Ground-Water Geology.
Theoretical and practical ground-water hydrogeology and its relation to geomorphology, glacial geology, sedimentology, and engineering geology.
Prerequisites, Chemistry 1 and 2, 15 hours of geology; 645 (78) and 666 (94) recommended. *Credit, 3* Mr. Motts.

790 (241). Seminar.
Review of current literature or discussion of selected topics.
Credit, 1 each semester. Maximum credit, 2. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

805 (245). Evolution of Geologic Concepts.
Perspective on current geological thought in the light of its historical background; particular attention to controversial questions and to the rise and decline of ruling theories.
Prerequisite, one year of graduate study. *Credit, 2.* Mr. Motts.

846 (225). Cenozoic Stratigraphy.
Occurrence, correlation, and origin of marine and terrestrial Cenozoic deposits and their relation to paleogeographic and tectonic conditions, with particular reference to North America.
Prerequisites, Geology 645 (178) and 660 (189); 735 (234) recommended.
Credit, 3. Mr. Webb.

863 (232). Physiography of North America.
A survey of the physiographic provinces of North America and their evolution, with emphasis on problems and methods of approach.
Prerequisite, Geology 660 (189) and 735 (234) desirable.
Credit, 3. Mr. Motts.

887 (219). Advanced Hydrogeology.
Advanced ground-water hydrology, analog models, pumping tests, flow-duration curves, flow nets, Hubbert's hydrologic models, water chemistry, and geophysical methods of investigation.
Prerequisites, Geology 786 (218) and Math. 110 (10), or permission of instructor. *Credit, 3.* Mr. Motts.

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

611 (181). Optical Mineralogy.
Principles of optics, optical properties of minerals and methods for their measurement, relationship between optical properties and crystallography, and mineral identification by the immersion method.
Prerequisites, Geology 110 (42), Physics 103 (3) and 104 (4).
Credit, 3. Mr. Nelson.

621 (182). Petrography.
Identification of minerals in thin section, study of common igneous, sedimentary, and metamorphic rocks in thin section, routine petrographic calculations and measurements, and introduction to petrogenetic theory. Examination of selected igneous and metamorphic rocks in the field.
Prerequisites, Geology 220 (56) and 611 (181).
Credit, 3. Mr. Robinson.

645 (178). Principles of Stratigraphy.
Principles of stratigraphic correlation as related to the major rock units of the United States and Europe.
Prerequisite, Geology 550 (174). *Credit, 3.* Mr. Webb.

655 (180). Physical Oceanography.
Physical properties of sea water and their variations; water masses and their circulation patterns; interaction between ocean and atmosphere; dynamics of waves, tides, and ocean currents; techniques of oceanographic study.
Prerequisites, Two years of college work toward a major in science or engineering; Physics 103 (3) and 104 (4), or 105 (5), 106 (6), and 107 (7); calculus recommended. *Credit, 3.* Mr. Hayes

660 (189). Geomorphology.
Origin and development of landforms in relation to geological processes, climatic environment, and tectonic history. Application of geomorphic methods to interpretation of Cenozoic geologic history.
Two class hours, one 2-hour laboratory period.
Prerequisites, Geology 101 (1), 102 (2), and 130 (33).
Credit, 3. Mr. Smith.

666 (194). Pleistocene Geology.
Geochronolgy of Pleistocene time as related to climatic changes and their influence on glaciology, erosional and depositional processes, landforms, sedimentary deposits, shifting sea level, and the paleontological record. Field trips by arrangement.
Two class hours, one 2-hour laboratory period.
Prerequisites, Geology 101 (1) and 102 (2). *Credit, 3.* Mr. Motts.

668 (191). Photogeology.
A laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos.
Two 3-hour laboratory periods.
Prerequisites, Geology 130 (33) and 531 (172). *Credit, 3.* Mr. Smith.

670 (213). Geophysics.
The physics of the earth and the gravitational, magnetic, electrical, and seismic methods of geophysical exploration. Laboratory work consists of problems and computations.
Prerequisites, Geology 130 (33) and 520 (156) or permission of instructor.
Credit, 3. Mr. Rice.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Geology)

520 (156). Lithology.
A descriptive study of the classes of rocks with reference to manner of origin, modes of occurrence, structural features and the chemical and petrographic distinction within each group.
One class hour, two 2-hour laboratory periods.
Prerequisites, Geology 101 (1) and 110 (42). *Credit, 4.* Mr. Nelson.

531 (172). Geologic Field Mapping.
An introduction to the instruments and techniques used in field mapping, and their application to the geologic mapping of selected areas. Eight field hours, by arrangement.
Prerequisites, Geology 130 (33) and 520 (156) or permission of instructor.
Credit, 3. Mr. Robinson and Mr. McGill.

540 (163). Invertebrate Paleontology.
History, development and identification of invertebrate animal fossils. Field trips by arrangement.
Prerequisites, Geology 102 (2) and Zoology 101 (1).
Credit, 3. Mr. Pitrat.

550 (174). Sedimentology.
Composition, classification, and origin of sedimentary rocks, including discussion of source area, mode of transportation, deposition and diagenesis. Prerequisites,Geology 101 (1), 102 (2) and 110 (42).
Credit, 3. Mr. Motts.

580 (150). Engineering Geology.
Materials and surface features of the earth and their relation to engineering problems; map reading as related to the phenomena of physical geology. Two class hours, one 3-hour laboratory period. *Credit, 3.* Mr. Farquhar.

PROFESSIONAL COURSES
(No credit towards a degree in Geology)

403 (125). Concepts of Earth Science for Teachers.
Evolution of earth and life; basic materials, principles, and methods of study; relation to other sciences; role in modern life; use of maps, specimens, literature, and field studies. *Credit, 3.* The Staff.

GERMAN AND RUSSIAN

GRADUATE FACULTY
Head of Department
F. C. Ellert
Professors
P. Heller
H. J. Weigand
Assistant Professors
R. Hauser
E. Schiffer
L. M. Tikos

Master of Arts
Prerequisites for admission: A B.A. degree with a major in German language and literature and indication of ability to do successful graduate work. Deficiencies in literary background and insufficient command of spoken or written German must be made up before the candidate can be admitted to certain courses required for the degree.

Language: For this degree the student must have, or must acquire, a reading knowledge of at least one major language, modern or ancient, other than German and English.

Program of study: A minimum of twenty-one credits in the major field. Twelve of these credits must be earned in "courses open to graduate students only" 700-999 (200) series, unless a student chooses to offer a thesis in place of six of these credits. The "Proseminar" is required. One course must be of linguistic character; this will normally be the course in Middle High German.

Cooperative Ph.D. Degree in German
In order to enroll for this program candidates must satisfy a Screening Committee as to their qualifications for advanced work in the field. Language requirements include a reading knowledge of French and of an additional lan-

guage (other than German or English) pertinent to the candidate's field of specialization. Study programs for Ph.D. candidates, which must include 1) Old High German or Gothic and 2) Middle High German, will be determined by the Guidance Committees.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Problems Course.
Directed study in some special area of literature or linguistics.
Credit, 3-12. The Staff.

701 (201). Middle High German.
Readings in Middle High German Literature in the original with an introduction to the grammar. *Credit, 3.* Mr. Schaefer.

702 (202). German Literature in the Middle Ages.
A study of German literature from the earliest literary documents to the 15th century. *Credit, 3.* Mr. Schaefer.

704 (204). Germanic Philology.
Gothic, Old High German. *Credit, 3.* The Staff.

706 (206). The Age of Humanism and the Reformation.
German literature between 1400 and 1600; *Der Ackermann aus Böhmen,* Brant, Murner, Hutten, Luther, Hans Sachs. *Credit, 3.* The Staff.

711 (211). The Age of Enlightenment with special reference to Lessing. *Credit, 3.* Mr. Heller.

713 (213). Young Goethe.
A close survey of Goethe's work prior to the Weimar period.
Credit, 3. Mr. Heller.

714 (214). The Classical Goethe. *Credit, 3.* The Staff.

721 (221). Schiller.
A study of his life and works. *Credit, 3.* The Staff.

725, 726 (225, 226). The German Bildungsroman.
Goethe, Novalis, Keller, Stifter, Mann, Hesse.
Credit, 3 credits each semester. Mr. Weigand.

730 (230). Heine and his Age. *Credit, 3.* Mr. Ellert.

735 (235). The Drama of the Romantic Period.
Comprehensive treatment of the works of Tieck, Kleist and Grillparzer.
Credit, 3. The Staff.

736 (236). The Realistic Drama.
Comprehensive treatment of the works of Hebbel, Büchner and Hauptmann.
Credit, 3. Mr. Hauser.

740 (240). Lyrical Poetry of the XXth Century.
Intensive study of the works of George, Hofmannsthal and Rilke.
Credit, 3. Mr. Weigand.

745 (245). Nihilism and Affirmation in Contemporary Literature.
A study of drama, fiction and essays reflecting the crisis of the modern age, with special emphasis on the period of Expressionism. *Credit, 3.* Mr. Heller

755 (255). Stylistics.
An advanced course in German composition, audio-lingual proficiency, literary interpretation, and grammar. *Credit, 3.* The Staff.

770 (270). Proseminar.
Introduction to methods of literary interpretation, bibliography, research and criticism. Reports and papers on selected texts. Close discussion of secondary sources in the field of literary scholarship (e.g., W. Kayser's *Das sprachliche Kunstwerk;* E. Staiger's *Kunst der Interpretation*). Required of all majors. *Credit, 3-9.* Mr Heller and Mr. Lea.

780 (280). Seminar.
Close study of a single topic, author or work. One of the main purposes of the course is to suggest projects for independent research to advanced students. The subject matter will vary from year to year. Topic for 1964-65: Werfel *Credit, 3-9.* Mr. Ellert.

800 (300). Thesis, Master's Degree. *Credit, 6-9.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

551 (151). Nineteenth Century Prose.
German prose from the death of Goethe to 1890 (early realism to naturalism) with emphasis on literary and social forces in the works of Stifter, Keller, Fontane, and others. *Credit, 3.* Mr. Weigand.

552 (152). Poetry and Drama of the Nineteenth Century.
The development of the drama and of lyric poetry from 1830 to 1890 with special emphasis on dramatic works of Grillparzer, Hebbel, and Büchner and the poetry of Morike and C. F. Meyer. *Credit, 3.* Mr. Hauser.

553 (153). Twentieth Century Prose.
Main literary currents in contemporary German prose from Nietzsche to Hesse with particular attention to the works of Thomas Mann, Kafka, and Werfel. *Credit, 3.* Mr. Lea.

554 (154). Poetry and Drama of the Twentieth Century.
Reading and discussion of significant lyrical works of Hofmannsthal, George, and Rilke, and representative dramas by Hauptmann and Georg Kaiser. *Credit, 3.* Mr. Lea.

555 (155). Storm and Stress.
Storm and Stress in German literature centering in the young Goethe. *Credit, 3.* Mr. Ellert.

556 (156). Romanticism.
The poetry and prose writings of the romantic period from Novalis to Heine. *Credit, 3.* Miss Schiffer.

557 (157). Goethe's Faust.
Credit, 3. Mr. Ellert, Mr. Heller or Mr. Weigand.

559 (159). The Germanic Languages.
An introduction to General and Germanic philology for German and English majors; a survey of the relationship between German, English, and the other Indo-European tongues and of the historical development of German and English as the two major Germanic literary languages. *Credit, 3.* Mr. Schaefer.

Comparative Literature

571 (171). The Enlightenment.
Characteristic themes, ideas and attitudes in 18th Century European literature. The course will focus on major representatives of the Ages of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany.
Prerequisite, proficiency in French or German.
Credit, 3. Mr. Heller and Mr. Page.

591 (191). Anglo-German Literary Relationships.
Credit, 3. Mr. Page and Mr. Weigand.

Russian

553 (153) (I). Dostoevsky. *Credit, 3.* The Staff.

554 (154) (II). Tolstoy. *Credit, 3.* The Staff.

556 (156) (II). Russian Drama.
Drama in the originals from the beginnings to the establishment of a national theatre culminating in plays of Ostrovskij, Chekhov, Gorky.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

557 (157) (I). Soviet Literature.
A representative study of the beginnings and development of Soviet prose, drama and criticism from Gorky to Sholokhov and Pasternak.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

558 (158) (II). Russian Poetry.
Russian poetry in the originals, from the early days of the 19th century to the present, with an emphasis on the major poetic trends.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

564 (164) (II). The History of the Russian Language.
A description of the historical development of the Russian language (and its relation to other languages) from the earliest period to the present.
Prerequisite, Russian 62, Junior or Senior standing. *Credit, 3.* The Staff.

GOVERNMENT

GRADUATE FACULTY

Head of Department
W. C. Havard, Jr.

Professors
L. P. Beth
J. Fenton (Commonwealth)
J. S. Harris (Commonwealth)
F. E. Oppenheim
F. A. Vali

Associate Professors
G. Braunthal
F. W. Houn
G. Lewy
L. C. Mainzer
S. Rothman
A. H. Syed

Assistant Professors
I. Abu-Lughod
L. A. Allen

In addition to the general requirements for the Master of Arts degree, candidates in Government must possess a reading knowledge of a foreign language approved by the department or an adequate knowledge of statistics where appropriate. An acceptable Master's thesis is also required.

Study programs for Ph.D. candidates will be determined by the Guidance Committees—the designation of fields in political science to be covered and the selection of courses in minor field (if any).

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

Prerequisite, Government 601 (280).
The major trends of twentieth-century political theory will be surveyed; in addition, intensive analysis of selected thinkers of this period will be carried out. Prerequisite, a course in political theory.
Credit, 3. Mr. Havard, Mr. Oppenheim or Mr. Lewy.

602 (281). Selected Problems in Political Theory.
An examination of significant problems within the field of political theory. Students will be asked to study traditional solutions and to devise original solutions.
Prerequisite, Government 601 (208).
Credit, 3. Mr. Havard, Mr. Oppenheim or Mr. Lewy.

619 (275). Politics and the Legislative Process.
Selected topics relating to American politics, political parties, elections and the legislative process.
Prerequisite, Government 518 (163). *Credit, 3.* Mr. Fenton.

620 (276). Research in Political Behavior.
Introduction to research techniques as applied to special problems in the field of political behavior. Emphasis upon various approaches to the study of the individual voter, the American politician, interest groups and legislatures.
Credit, 3. Mr. Fenton.

621 (277). Directed Studies in Politics.
The study in depth of a particular aspect of political behavior. The content of this course will vary with the particular research interests of the instructor and the students. *Credit, 3.* Mr. Fenton.

636 (290). Comparative Government.
An historical and functional analysis of the institutions of government in modern democracies and dictatorships.
Prerequisite, Government 26.
Credit, 3. Mr. Allen, Mr. Braunthal or Mr. Harris.

637 (291). Comparative Political Parties and Politics.
The ideology, structure and dynamics of diverse types of political parties, party systems and electoral systems, in an effort to suggest interrelationships.
Credit, 3. Mr. Allen, Mr. Braunthal or Mr. Harris.

638 (292). Seminar in Comparative Government.
Intensive study of selected political systems and of particular governmental institutions and processes.
Credit, 3. Mr. Allen, Mr. Braunthal or Mr. Harris.

639 (293). Seminar of the Government and Politics of South Asia.
Intensive study of selected problems relating to the government and politics of India, Pakistan, and Ceylon. *Credit, 3.* Mr. Syed.

640 (296). Seminar on East Asian Politics.
Intensive study of selected problems relating to the politics of China, Japan and other Asian countries. *Credit, 3.* Mr. Houn.

655 (260). Problems of International Relations.
Analysis of major problems in international relations.
Prerequisite, Government 554 (153). *Credit, 3.* Mr. Vali or Mr. Braunthal.

656 (261). Problems of International Law and Organization.
Analysis of major problems in international organizations.
Prerequisite, Government 556 (168) or 557 (170).
Credit, 3. Mr. Vali or Mr. Braunthal.

657 (295). East Asian Foreign Policies.
Study of the foreign policies of China, Japan and other East Asian countries in modern times and of Western diplomacy in the area. *Credit, 3.* Mr. Houn.

658 (262). Theory of International Politics.
Analysis and conceptualization of the forces and drives that condition politics among nations. *Credit, 3.* Mr. Syed.

672 (250). Public Administration: Organization.
Behavior within governmental bureaucracy, in terms of the interaction between the individual and organization influences.
Prerequisite, Government 572 (161) or 575 (178).
Credit, 3. Mr. Harris or Mr. Mainzer.

673 (251). Public Administration: Responsibility.
Problems of political responsibility of government bureaucracy within specific constitutional systems.
Prerequisite, Government 572 (161) or 575 (178).
Credit, 3. Mr. Harris or Mr. Mainzer.

674 (253). Comparative Public Administration.
Comparative study and analysis of the government administrative systems of the U.S., Britain, Canada, France, the U.S.S.R., and selected other countries.
Prerequisite, Government 572 or permission. *Credit, 3.* Mr. Harris.

690 (270). Seminar in Public Law.
A study of selected topics in public law.
Prerequisites, Government 590 (164) or 591 (165) or equivalent.
Credit, 3. Mr. Beth.

691 (271). Law and the Political Process.
The interrelationships between law and politics, and the necessity for law in organized societies.
Prerequisites, Government 590 (164) or 591 (165) or equivalent.
Credit, 3. Mr. Beth.

700 (200). Special Problems. *Credit, 1-6.*

800 (300). Thesis, Master's Degree. *Credit, 6.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

501 (171). Ancient and Medieval Political Thought.
The development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages.
Credit, 3. Mr. Lewy, Mr. Havard.

502 (172). Modern Political Thought.
The development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present.
Credit, 3. Mr. Havard, Mr. Lewy and Mr. Oppenheim.

503 (166). American Political Thought.
The development of American political thought from Colonial times to the present. *Credit, 3.* Mr. Oppenheim or Mr. Syed.

504 (191). Scope and Methods of Political Science.
Critical examination of the scope and unity of political science and the significant methodological positions and research techniques.
Credit, 3. Mr. Mainzer.

519 (151). Municipal Government.
A survey of the governmental structure and function of American municipalities.
Credit, 3. Mr. Grady.

520 (154). State Government.
State politics, organization and functions with emphasis on the role of the state in our federal system. *Credit, 3.* Mr. Coulter.

521 (155). The Presidency in American Government.
The growth of the executive in United States Government. Varying conceptions of the presidential office. Constitutional and political aspects of the office in legislation, administration and conduct of foreign and military affairs. The president as party leader.
Prerequisite, Government 100. *Credit, 3.* Mr. Gordon.

522 (156). The Legislative Process.
The role of the legislature in national and state government. The functions of legislatures; legislative procedures; the role played by political parties and pressure groups in the legislative process.
Emphasis on research.
Prerequisite, Government 100 or 523. *Credit, 3.* Mr. Mayhew or Mr. Fenton.

523 (163). Political Parties and Elections.
The American political process, with emphasis on parties, pressure groups, and public opinion. *Credit, 3.* Mr. Gordon, Mr. Fenton, Mr. Mayhew.

524 (189). Metropolitan Politics.
A study of the problems of metropolitan areas from the standpoint of the actual and possible political approaches to their solution. Includes the role of parties, development of political leadership, existing political institutions, pressure group activity, and other relevant political phenomena.
Prerequisite, Government 523 or equivalent. *Credit, 3.* Mr. Coulter.

525 (176). Public Opinion in Politics.
Opinion and communication as aspects of the political process with emphasis upon communication through mass media. The relations between mass attitudes and communication and political institutions and the formation of public policy.
Credit, 3. Mr. Fenton.

536 (157). The Government and Politics of Russia.
The development, organization and functioning of the Communist party; governmental organization and the administrative process; terror as a system of power; organization for governmental control in industry and agriculture; Soviet foreign policy, its formation and execution.
Prerequisite, Government 25. *Credit, 3.* Mr. Vali, Mr. Ryavec.

537 (185). Major Governments in Asia.
A comparative analysis of the government and politics of selected democratic and non-democratic countries in Asia—Japan, India, Pakistan, Indonesia, and Communist China. *Credit, 3.* Mr. Houn and Mr. Syed.

554 (153). International Relations.
The nation-state system and conceptions of national interest in modern world politics. The forms and distribution of power by which states seek to implement national interests. The making of foreign policy and methods of adjusting international conflict. Current international problems.
Prerequisite, Government 150 or equivalent.
Credit, 3. Mr. Ryavec, Mr. Braunthal, Mr. Vali and Mr. Allen.

555 (152). American Foreign Policy.
Constitutional, political and administrative considerations which influence the formulation and execution of American foreign policy. Special emphasis on current issues. *Credit, 3.* Mr. Braunthal and Mr. Allen.

556 (168). International Law.
The origin, character, and function of international law.
Prerequisite, Government 554 or equivalent.
Credit, 3. Mr. Braunthal or Mr. Vali.

557 (170). International Organization.
International organization in the twentieth century, with emphasis upon the United Nations and regional organizations.
Prerequisites, Government 150 and 554 or equivalent.
Credit, 3. Mr. Braunthal or Mr. Vali.

572 (161). Public Administration.
Organization and management in modern government, with emphasis on the bureaucracy's role in public formation. *Credit, 3.* Mr. Mainzer, Mr. Sweeney.

573 (183). Public Personnel Administration.
Theory, practice, and organization of the personnel functions in governmental administration, including recruitment, testing, classification, compensation, promotions, training, and employee relations.
Prerequisite, Government 100 or 572. *Credit, 3.* Mr. Mainzer, Mr. Sweeney.

574 (162). Administrative Law.
Governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate.
Credit, 3. Mr. Mainzer.

575 (178). Municipal Administration.
Administrative management in American municipalities based on descriptive literature, case materials and personal observation, with particular attention to Massachusetts cities and towns.
Prerequisite, Government 519 or equivalent. *Credit, 3.* Mr. Grady.

576 (184). Governmental Financial Administration.
Theory, practice and organization, including budgeting, revenues, debt operations, records, administration, purchasing, audits, and financial reporting.
Prerequisite, Government 100 and 519 or 572 or equivalent. *Credit, 3.*

590 (165). Constitutional Law.
A study of the United States Constitution as interpreted by decisions of the Supreme Court.
Prerequisite, Government 100. *Credit, 3.* Mr. Beth.

591 (164). Civil Liberties.
A study of the development in American Constitutional Law of the concept of civil liberty, including the following fields: free speech and religion, fair trial, and race discrimination. The function of courts in the safeguarding of these liberties.
Prerequisite, Government 100 (25). *Credit, 3.* Mr. Beth, Mr. Lewy.

593, 594 (195, 196). SEMINAR.
Special problems in the field of government.
Prerequisite, permission of the department. *Credit, 3.* The Staff.

Interdepartmental Courses

SOCIAL SCIENCE 550 (160). AFRICA, SOUTH OF THE SAHARA.
Recent political, economic, and social developments in the principal countries in Africa south of the Sahara.
Prerequisites, at least two courses in one or more of the following fields: Government, Economics, Sociology. *Credit, 3.* The Staff.

SOCIAL SCIENCE 569 (169). INDIA AND SOUTHEAST ASIA.
Recent political, economic, and social developments in India and the countries of South and Southeast Asia.
Prerequisites, at least two semester courses in one or more of the following fields: Government, Economics, and Sociology. *Credit, 3.* Mr. Driver.

HISTORY

Head of Department
H. H. Quint

Professors
T. C. Caldwell
H. W. Cary
H. J. Gordon, Jr.
R. A. Potash

Associate Professors
P. A. Gagnon
L. S. Greenbaum
V. Ilardi
R. A. Powers
S. Williams

Assistant Professors
M. Cantor
C. E. Cody, Jr.
M. DePillis
F. B. Wickwire

THE PH.D. PROGRAM

The Department of History offers doctoral work in seven major fields: (1) Medieval; (2) Early Modern Europe; (3) Modern Europe; (4) Great Britain; (5) Latin America; (6) the United States to 1860; and (7) the United States since 1860. The doctoral candidate will concentrate his course of study in four of them and his program will be determined by his guidance committee. He must take a minimum of four graduate seminars in at least three of his chosen fields. Such seminars will concentrate on research training and the techniques of historical writing.

At the conclusion of the candidate's first two semesters of graduate work at the University he will be required to take a preliminary "screening" examination; failure to pass it will automatically bar him from further study for the Ph.D. degree, but not from acquiring the M.A. degree. The General Examina-

tion will be taken no later than the end of the student's fifth semester of full-time work or its equivalent. Not until he has passed the General Examination will he be admitted to formal candidacy for the doctoral degree.

A student entering the University of Massachusetts with previous graduate training at other institutions may be admitted to the graduate program with advanced standing at the discretion of the Department. The Department's Graduate Committee will evaluate his previous graduate training and he will be informed of his exact status upon notification of admission to the Department's graduate program.

THE M.A. PROGRAMS

I. Regular Master of Arts Program.

1. Each graduate student entering this program will select a major field of concentration from among those offered by the History Department for doctoral work. Selection of the student's advisor will be based upon his selection of field.

   All M.A. candidates must demonstrate a reading proficiency in one foreign language. Students who plan to specialize in areas where English is not the basic language will be required to demonstrate to the Department a reading proficiency in the relevant foreign language upon entrance.
   A student specializing in an area of History where English is not the basic language will also be required to utilize the relevant foreign language either in a seminar paper or in a thesis.

2. Basic Course Requirements.
   a. Each student must complete 30 credit hours for the Master's degree. Six of these credits may be earned by the preparation of a thesis at the election of the student.
   b. Each student may take as many as six hours in associated disciplines at the discretion of his advisor.
   c. Four courses is the normal permissible load per semester.
   d. Each student will complete a minimum of two courses in Historiography.
   e. Each student will complete a minimum of two seminars, unless he chooses to write a thesis, in which case he may be exempted from one seminar.

3. Examination.
   Each student will take a screening examination after fulfilling all other requirements for the Master of Arts degree. The examination will consist of broad questions intended to test his ability to employ his knowledge and imagination rather than to test the depth or extent of his knowledge. This examination will serve a double function: (a) It will be both a comprehensive examination for the Master's degree and (b) a selection examination (one factor) for the doctorate. The selection grade for continued graduate work will be substantially higher than the minimum passing grade for the Master's degree.

II. Special Master of Arts Program.

The Department offers an M.A. option especially designed for those who are currently engaged in secondary school teaching. For details write to the Chairman, Department of History.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in History.
Directed research and writing for qualified students.
Prerequisite, permission of instructor. *Credit, 1-6.* The Staff.

701 (224). European Historiography to the Enlightenment.
Critical evaluation of the techniques and ideas of major historians and influential schools of historical interpretation from the Greeks through the Renaissance. *Credit, 3.* Mr. Williams and Mr. Ware.

702 (225). European Historiography, The Enlightenment to the Present.
A study of the techniques and ideas of major historians and influential schools of historical interpretation, and the relation of historiography to the intellectual and political history of modern Europe. *Credit, 3.* Mr. Powers.

703, 704 (201, 202). American Historiography.
Interpretations of major themes as developed in the works of leading historians. The first course will treat the period through the Civil War; the second, 1865 to the present. *Credit, 3 each semester.* The Staff.

705 (215). Philosophy of History.
A consideration of the "philosophy of history" both as epistemology and as a method of explanation, and a comparison of the aims of history and the sciences. The course involves an analysis of the nature of history: the difference between truth and fact, the possibility of objectivity, and the theory of historical explanation. Major historians in the field are read, from Thucydides and Augustine to Croce and Toynbee. *Credit, 3.* Mr. Powers.

711 (210). Topics in Early Medieval History.
Continuity between ancient and medieval civilization.
Prerequisites, working knowledge of Latin and one modern language (German, French, Italian) or by special permission of instructor.
Credit, 3. Mr. Williams and Mr. Ware.

712 (211). Topics in the Age of the Renaissance and Reformation.
A study of European culture between 1400 and 1600. A reading knowledge of a modern European language is generally required. *Credit, 3.* Mr. Ilardi.

713 (212). Topics in the Age of the Enlightenment.
The movement of ideas in Atlantic civilization during the 18th Century. Study of the mind and writings of representative European and American thinkers with emphasis upon politics, religion, science, literature and the arts.
Credit, 3. Mr. Greenbaum.

714 (221). Topics in Tudor and Stuart England.
Selected aspects of the Tudor age; the interplay of social, economic, intellectual and political factors involved in the Stuart Revolution. Constitutional development receives major emphasis. *Credit, 3.* Mr. Caldwell.

715 (208). Recent European History.
Basic developments in diplomatic, political, social and economic history since 1890 with particular emphasis upon organic growth and change.
Credit, 3. Mr. Gordon.

716 (222). World War II and Aftermath.
A study of pre-nuclear total war in its military development and its political, economic and social ramifications in modern Western society, followed by a study of the postwar settlements and their effects.
Credit, 3. Mr. Gagnon and Miss von Oppen.

717 (218). Topics in the Recent Social History of Europe.
The social changes resulting from the industrialization of Europe since 1815 and their relationship to economic and political developments. The student is introduced to the methods and materials needed for effective work in recent social history. He is guided through a series of short problems illustrating proper utilization of the sources. *Credit, 3.* Mr. Gordon.

718 (220). Topics in Nineteenth Century Intellectual History.
Selected major currents in European thought since the French Revolution, their origins, development and influence. Reading knowledge of French or German is desirable. *Credit, 3.* Mr. Powers.

719 (216). Problems in British Imperial History Since 1783.
Aspects of such general topics as the problems of imperial government after the American Revolution, the Durham Report and the growth of the dominions, the difficulties and effect of implantation of British institutions in Asia and Africa, the lessening of British control and the Statute of Westminster, and the political and economic importance of the Commonwealth in world affairs.
Credit, 3. Mr. Wickwire.

720 (207). Britian in the Nineteenth Century.
Central themes and topics. Emphasis on the history of thought in its relation to political, economic and social developments. *Credit, 3.* Mr. Caldwell.

721 (217). Problems in Russian History.
Russia in the 19th and 20th centuries with particular emphasis on Russian and Soviet historiography. The student has the opportunity of doing intensive reading and presenting careful analyses of selected topics.
Credit, 3. Mr. Dilkes.

722 (219). Topics in Modern Spanish History.
Spanish history from the end of the reign of Philip II to the end of the Spanish Civil War. The course deals with such selected topics as: the problem of 17th centurv "decadence"; Spain and the Enlightenment; Spanish reaction to the French Revolution; Spanish Liberalism and the Carlist Wars; the First Republic, the Catalan Question and cantonalism; the rise of radical parties, Socialist and Anarchist, under the Old Regime; and the Second Republic and the Spanish Civil War. *Credit, 3.* Mr. Leonard.

731 (205). Era of the Confederation and the Constitution.
The formative years of the American nation; the evolution of federal and state constitutions; basic political issues and conflicts; the pattern of economic and social development; and the origins of American foreign policy.
Credit, 3. Mr. Davis and Mr. Bernhard.

738 (213). Topics in United States Intellectual History.
Specific aspects of such general topics as the American adaptation of the European heritage, the growth of the concept of Americanism, the emergence of patrician leadership, the achievement of realistic democracy, the triumph of nationalism, the assertion of individualism in a corporate society, and the scientific-humanistic culture conflict. *Credit, 3.* Mr. Quint.

739 (214). Topics in Massachusetts History.
The development of the Commonwealth and its relationship to regional and national institutions and thought from early colonial times to the present. The course, utilizing abundant primary and secondary source materials, provides a foundation for the pursuit of further research. *Credit, 3.* Mr. Cary.

745 (209). Topics in Contemporary Latin American History.
A study of major movements since about 1930 with attention directed to the political, economic, social, and ideological forces contributing to change. A reading knowledge of Spanish or Portuguese is generally required.
Credit, 3. Mr. Potash.

751 (264). Medieval History.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Williams and Mr. Ware.

752 (265). Renaissance and Reformation.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ilardi.

753 (266). The Enlightenment.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Greenbaum.

754 (267). Eighteenth Century Britain.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Wickwire.

755 (260). Modern English History.
Research on selected topics, 1890-1940.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Caldwell

756 (268). Modern Germany.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Gordon and Miss von Oppen.

757 (269). Modern France.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Gagnon.

758 (270). Russian History.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Dilkes.

759 (259). European Diplomacy Between the Wars.
Training in historical research and an introduction into the relationships among European nations in a critical period.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Gordon and Miss von Oppen.

761 (252). United States in the Colonial Period.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Bernhard.

762 (253). Seminar in the Age of Jacksonian Democracy.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Cantor.

763 (254). Civil War and Reconstruction.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Thompson.

764 (256). Seminar in the Westward Movement of the United States.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. DePillis and Mr. Davis.

765 (258). The Progressive Era in the United States.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint.

766 (261). The United States Between the World Wars.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint.

767 (251). Seminar in American Diplomatic History.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Cary.

771 (262). Argentine History.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Potash.

772 (263). Mexican History.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Potash.

800 (300). Thesis, Master's Degree. *Credit, 5-10.*

900 (400). Thesis, Ph.D. Degree.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

500 (151). The Ancient World to Alexander the Great.
From the neolithic background of civilization to the dissolution of Alexander's Empire. *Credit, 3.* Mr. Williams and Mr. Ware.

501 (152). The Ancient World: The Hellenistic Period to Constantine.
From the development of Hellenistic civilization to the stagnation of Graeco-Roman culture. *Credit, 3.* Mr. Williams and Mr. Ware.

502 (161). Early Middle Ages 300-1100.
Spread of Christianity; pagan and early Christian culture; Germanic kingship; the Carolingian world; early feudalism; monasticism and ecclesiastical centralization. *Credit, 3.* Mr. Williams and Mr. Ware.

503 (162). The Later Middle Ages 1100-1350.
Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism.
Credit, 3. Mr. Williams and Mr. Ware.

504 (165). Tudor-Stuart England, 1485-1688.
Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. *Credit, 3.* Mr. Caldwell.

505, 506 (173, 174). The Age of the Renaissance and Reformation, 1300-1600.
A study of the changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Ilardi.

507 (175). Europe in the Enlightenment, 1685-1789.
Civilization of Western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions, and the growth of revolutionary spirit. *Credit, 3.* Mr. Greenbaum.

508 (194). The French Revolution and Napoleon.
Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon. *Credit, 3.* Mr. Greenbaum.

509 (176). History of Europe, 1815-1870.
Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-Prussian War.
Credit, 3. Mr. Gagnon.

510 (169). Europe, 1870-1918.
Internal developments of the prinicipal countries; a detailed study of conditions and diplomacy which led to the World War; and military and diplomatic history of the war years. *Credit, 3.* Mr. van Steenberg.

511 (170). Europe Since 1918.
Major developments in the internal and international affairs of the European states since World War I. *Credit, 3.* Miss von Oppen and Mr. van Steenberg.

512 (185). European Intellectual History in the Nineteenth Century.
Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture. *Credit, 3.* Mr. Powers.

513 (186). European Intellectual History in the Twentieth Century.
Philosophical, academic, literary, aesthetic, political and popular currents since 1900. *Credit, 3.* Mr. Powers.

514, 515 (155, 156). A History of Russia.
A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Dilkes.

516. The Russian Revolution.
A study of the forces bringing about the Bolshevik seizure of power of 1917 and its repercussions upon the rest of the world. *Credit, 3.* Mr. Dilkes.

517. Eastern Europe.
The economic, social, cultural and political condition of the Slavic people from the Baltic to the Aegean. *Credit, 3.*

518. Early Modern Germany.
The evolution of Germany from the late medieval period through the Napoleonic era. *Credit, 3.* Mr. Gordon.

519 (166). The History of Modern Germany.
The evolution and development of Germany since the accession of Frederick the Great with emphasis upon diplomatic, political, military and social-economic trends and problems. *Credit, 3.* Mr. Gordon and Miss von Oppen.

520. History of Spain Since the 15th Century.
The rise and fall of Spanish power to Spain's present position in the Western world. *Credit, 3.* Mr. Leonard.

521, 522 (131, 132). English History.
Emphasis on economic, social, and cultural influences, as well as constitutional development. Either semester may be elected independently.
Credit, 3. Mr. Caldwell and Mr. Wickwire.

523 (192). History of the British Empire and Commonwealth Since 1783.
Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent empire; role of the Empire in world politics.
Credit, 3. Mr. Wickwire.

524 (177). Modern Britain.
A study of selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. *Credit, 3.* Mr. Caldwell.

525 (178). France Since 1789.
A study of selected, formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France.
Credit, 3. Mr. Gagnon.

526. The Atlantic Community in the Twentieth Century.
A study of the idea and development of the Atlantic Community and the components and the forces working both for cohesion and atomization.
Credit, 3. Mr. Gagnon.

527 (193). Military History of Modern Europe.
Development of European military theory and practice from the Napoleonic era to the present. *Credit, 3.* Mr. Gordon.

600 (157). Colonial Latin America.
A study of Spanish and Portuguese expansion into the New World, the Indian cultures, the development of political, social, and economic institutions, and the growth of the independence movement to 1810. *Credit, 3.* Mr. Potash.

601 (158). Argentina and Brazil Since Independence.
The emergence of the major South American states. Particular attention will be paid to the themes of political organization and economic change; and in the contemporary period to the growth of nationalism and mass-based political movements. *Credit, 3.* Mr. Potash.

602 (159). The History of Mexico.
A study of Mexico from the end of the eighteenth century to the present. Emphasis will be given to political, economic, and social developments.
Credit, 3. Mr. Potash.

603. The Caribbean.
The geographical, cultural and political study of the Caribbean as a cockpit of five centuries of continuous struggle and adjustment.
Credit, 3. Mr. Leonard.

604. The History of Gran Colombia.
A comparison of the historical development of the Bolivarian republics, with particular emphasis on Colombia, Venezuela and Ecuador.
Credit, 3. Mr. Leonard.

620 (187). American Colonial History to 1763.
Discovery and exploration; early European settlements; systems of political and economic control; religious and intellectual development; and Anglo-French rivalry. *Credit, 3.* Mr. Bernhard.

621 (188). The American Revolutionary Era.
Coming of the Revolution; War for Independence; evolution of American federalism. *Credit, 3.* Mr. Bernhard.

622 (189). Jeffersonian and Jacksonian America.
Political, economic and social developments in the National Period.
Credit, 3. Mr. Cantor.

623 (191). Civil War and Reconstruction, 1860-1877.
Conduct of the war; political problems, national reunification.
Credit, 3. Mr. McFarland.

624 (183). The Progressive Age 1900-1920.
A study of the political response to the changing economic and social conditions in American life. *Credit, 3.* Mr. Thompson.

625 (184). Conservatism and Reform 1920-1945.
American political, economic and intellectual life between the two World Wars. *Credit, 3.* Mr. Thompson.

626, 627 (163, 164). History of American Thought and Culture.
The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Quint.

628 (167). United States Constitutional History to the Civil War.
Origins and development of American constitutionalism from the 17th century to the outbreak of sectional armed conflict. *Credit, 3.* Mr. Cantor.

629 (168). United States Constitutional History from the Civil War to the Present.
Evolution of constitutional power in modern America. *Credit, 3.* Mr. Cantor.

630 (160). Social History of the United States.
The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. *Credit, 3.* Mr. De Pillis.

631 (172). History of American Westward Expansion (1763-1893).
Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions. *Credit, 3.* Mr. DePillis and Mr. Davis

632 (171). The South in American History.
From early settlement to contemporary regional problems. *Credit, 3.* Mr. Thompson.

633 (179). New England to 1860.
A study of the colonial and early national periods, with emphasis upon the political, social and economic aspects of life in this region. *Credit, 3.* Mr. Cary and Mr. Bernhard.

634, 635 (181, 182). Diplomatic History of the United States.
The development of American foreign relations, 1776 to the present. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Cary.

650, 651 (153, 154). History of Far Eastern Civilization.
The first semester will stress traditional and modern China, the second, Japan and Korea. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Cody.

HOME ECONOMICS

GRADUATE FACULTY

Dean
M. A. Niederpruem

Professor
E. F. Reber

Associate Professors
G. M. Cook
A. Nichols
E. Rust

Assistant Professors
M. E. Lojkin
N. Myers

A Master of Science degree may be earned in the School of Home Economics by candidates who hold an accredited baccalaureate degree and are accepted under the general regulations of the Graduate School of the University. Emphasis may be selected from the areas of Food and Nutrition; Textiles, Clothing and Environmental Arts; Home Economics Education; Management and Family Economics; and Human Development.

In general, the baccalaureate degree of the applicant need not be in Home Economics. However, adequate concentration in studies basic to the areas of emphasis is required, or must be satisfied, before acceptance as a candidate will be granted.

Students applying for graduate work in Home Economics Education should have a Bachelor's degree in Home Economics and supporting disciplines to qualify for graduate work in one of the areas of emphasis listed above. Student's background should include some courses in Education and Practice Teaching. The candidates for this degree are required to take at least 9 credits in one subject matter area of Home Economics, excluding a problem or a thesis.

Other areas of emphasis require the following prescribed academic backgrounds: Food and Nutrition — strength in the physical and biological sciences; Textiles, Clothing and Environmental Arts — strength in the social sciences; Management and Family Economics — strength in the social sciences and mathematics; Human Development — strength in the biological and social sciences. Candidates interested in the latter area, which includes Child Development and Family Life, may wish to avail themselves of the privilege of affiliating at Merrill-Palmer in Detroit. Such students must take at least 15 credits in residence at the University.

FOOD AND NUTRITION (FN)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

421 (121). Developments in Nutrition Education.
Interpretation and application of changing and new concepts of nutrition — its place in schools and health programs.
Prerequisite, FN 352 (52) or 3 credits in a biological science. *Credit, 3.*

700 (200). Special Problems in Food or Nutrition. *Credit, 3-6.*

703 (203). Advanced Nutrition — Metabolism of Major Food Stuffs.
Metabolic role of carbohydrates, lipids, proteins and amino acids; biological oxidations; mechanisms of energy production and utilization.
Prerequisite, Biochemistry. *Credit, 3.*

704 (204). Advanced Nutrition — Vitamins and Minerals.
Metabolic role of vitamins and minerals, specific functions, requirements, sources, assay methods, effects of deficiencies and excesses.
Prerequisite, Biochemistry. *Credit, 3.*

710 (210). Seminar.
Readings, reports and discussions on the current literature in the area of Food or Nutrition. *Credit, 1-3. Maximum Credit, 6.*

800 (300). Thesis, Master's Degree.
Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

551 (191). Institutional Administration.
Principles of organization, management, sanitation, food service planning and equipment selection. 3 field trips.
Prerequisite, FN 251 (51) or 156 (56). *Credit, 4.*

552 (152). Advanced Nutrition.
Absorption, utilization, and interrelationship of food nutrients. Factors and critique of methods for determining nutrient requirements.
Prerequisites, FN 127 (27), 251 (51), Chem. 520 (179), Zool. 135 (35).
Credit, 3.

560 (194). Experimental Foods.
Fundamental principles of food quality evaluation; development of an independent research problem.
One class hour, two 3-hour laboratories.
Prerequisites, FN 251 (51), Chem. 160 (33) or permission of instructor.
Credit, 3.

573 (173). Nutrition During Growth and Development.
Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children.
Prerequisite, FN 127 (27) or 352 (52). *Credit, 3.*

575 (189). Nutrition in Disease.
Physiological basis for therapeutic diets in certain diseases. Current medical and nutrition literature used.
Prerequisites, Chem. 520 (179), Zool. 135 (35), FN 130 (30), 352 (52) or permission of instructor. *Credit, 3.*

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS (TCEA)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Textiles, Clothing and Environmental Arts. *Credit, 3-6.*

710 (210). Seminar.
Readings, reports and discussions on the current literature in the area of Textiles, Clothing and Environmental Arts. *Credit, 1-3. Maximum Credit, 6.*

800 (300). Thesis, Master's Degree.
Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

553 (153). Advanced Clothing Construction I.
Study of patterns and problems of fitting with opportunities for students to create original designs.
One class hour, two 2-hour laboratories.
Prerequisite, TCEA 128 (28), or permission of instructor. *Credit, 3.*

560 (160). Advanced Clothing Construction II.
Recent developments in clothing construction. Emphasis on tailoring methods and on handling of woolens and special fabrics.
One class hour, two 2-hour laboratories.
Prerequisite, TCEA 128 (28) or 253 (53), or permission of instructor. *Credit, 3.*

570 (186). Textiles II.
Analysis and evaluation of recent scientific and technical developments in fibers and finishes.
Prerequisite, TCEA 124 (24). *Credit, 3.*

576 (176). History of Decorative Arts.
Style periods in their historic contexts with emphasis on developments in furniture and furnishings. Illustrated lectures. Study tours.
Prerequisite, TCEA 123 (23) or permission of instructor. *Credit, 3.*

577 (177). History of Costume.
A study of Western Costume from ancient civilization to the present; exploration of the relationship of clothing to the period. *Credit, 3.*

578 (188). Advanced Interior Design.
Creative approach to architectural space; rendering of interiors with emphasis on interpreting textures, light and form in perspective.
One class hour, four studio hours.
Prerequisites, TCEA 123 (23), 279 (79), Art 500 (151), Ag. Eng. 251 (51) or equivalent. *Credit, 3.*

HOME ECONOMICS EDUCATION (HEEd.)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Home Economics Education.
Credit, 3-6.

710 (210). Seminar.
Readings, reports and discussions on the current literature in the area of Home Economics Education. *Credit, 1-3. Maximum Credit, 6.*

800 (300). Thesis, Master's Degree.
Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

581 (181). Adult Education in Home Economics.
Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement.
Prerequisite, minimum 6 credits in major area. *Credit, 3.*

582 (182). Curriculum and Methods in Home Economics.
Organization, scope and sequence of learning experiences in home economics education. Philosophy and content of curriculum, development of resource units, and methods of teaching.
Prerequisites, Psychology 601 (156), 563 (166), and Education 351 (151).
Credit, 4.

MANAGEMENT AND FAMILY ECONOMICS (MFE)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

430 (130). Home Management for Today's Families.
Emphasis on management principles involved in family economics, work simplification, and decision making in the home. For those who work in an advisory capacity with families.
Prerequisites, B.S. degree in Home Economics, MFE 275 (75), 377 (77), or equivalent, and professional experience. *Credit, 3.*

700 (200). Special Problems in Management and Families Economics.
Credit, 3-6.

710 (210). Seminar.
Readings, reports and discussions on the current literature in the area of Family Economics and Home Management.
Credit, 1-3. Maximum Credit, 6.

800 (300). Thesis, Master's Degree.
Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

550 (150). Family Management and Decision Making.
A presentation of the integrated nature of management in the family; concerns values and goals as reflected in decision making about family resources.
Prerequisite, permission of instructor. *Credit, 3.*

575 (175). Personal and Family Economics.
Analyzing financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society.
Prerequisite, Economics 25, or permission of instructor. *Credit, 3.*

HUMAN DEVELOPMENT (HD)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Human Development. *Credit, 3-6.*

710 (210). Seminar.
Readings, reports and discussions on the current literature in the area of Human Development. *Credit, 1-3.*

800 (300). Thesis, Master's Degree.
Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

570 (170). Child Development.
The study of the child from the developmental point of view. Emphasis on interaction of heredity and environment on development.
Prerequisites, Sociology 101 (1), Psychology 101 (1), or permission of instructor. *Credit, 3.*

572 (172). Directed Nursery School Observation.
Directed experience in observation techniques with nursery school children.
Prerequisite, HD 570 (170) or equivalent. *Credit, 3.*

583 (183). Nursery School Management.
Principles and methods of Nursery School Education. Directed experience in teaching and curriculum planning for three- and four-year-old children. Field trips.
Prerequisite, HD 570 (170) or equivalent, 572 (172). *Credit, 3.*

584 (184). Nursery School Management.
Continuation of 583 (183).
Prerequisite, HD 583 (183) or permission of instructor. *Credit, 3.*

LANDSCAPE ARCHITECTURE

GRADUATE FACULTY

Head of Department
R. H. Otto

Professor
P. N. Procopio

Associate Professor
T. S. Bacon, Jr.

Assistant Professors
T. S. Hamilton, Jr.
R. L. Kent, Jr.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems.
Individual study by the B.L.A. candidate in lieu of a thesis; or exploratory work preliminary to the thesis by the M.L.A. candidate.
Credit, 3. The Staff.

790 (290). Theory.
Special studies in the history and theory of landscape architecture and planning. *Credit, 3.* Mr. Kent or Mr. Bacon.

791 (291). Design.
Individual problems in any or all branches of public and private work.
Credit, 3. Mr. Otto.

792 (292). Construction.
Road alignment, computations and advanced landscape construction.
Credit, 3. Mr. Procopio.

793 (293). Presentation.
Studies in drafting, pen and crayon, rendering, water coloring, etc.
Credit, 3. Mr. Kent.

794 (294). Practice.
Professional field work under supervision, conducted upon going projects as opportunity offers. *Credit, 3.* The Staff.

797 (297). Architecture.
Selected problems. *Credit, 3.* Mr. Kantianis.

800 (300). Thesis, Master's Degree. *Credit, 10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

533 (171). Planting Design.
The utilization of plant materials in combination as applied to the many conditions and demands of landscape work. *Credit, 3.* Mr. Procopio.

567 (167). Architecture.
Architectural development, including styles and forms in architecture, especially as affected by materials and methods of construction.
Credit, 3. Mr. Kantianis.

568 (168). ARCHITECTURAL DESIGN.
The relations between exterior and interior spaces and structures as a primary element in design and construction. A series of problems integrating theory, design analysis, and graphics. *Credit, 4.* Mr. Kantianis.

573, 574 (173, 174). CITY PLANNING.
The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. Either semester may be elected independently.
Credit, 3 each semester. Mr. Bacon.

575, 576 (175, 176). PROJECTS IN PLANNING.
An application of the principles of modern civic development through a series of problems on the design of various types of urban land areas.
Credit, 3 each semester. Mr. Bacon.

577, 578 (177, 178). URBAN PROBLEMS.
Housing, industrial location and development, decentralization, arterial systems, civic and metropolitan design, and regional planning.
Open to non-majors.
Prerequisites, L.A. 573 (173) and 574 (174) or permission of instructor.
Credit, 3 each semester. Mr. Bacon.

581, 582 (181, 182). ADVANCED DESIGN.
Comprehensive site planning projects covering the major areas of landscape and urban design, plus exchange problems whenever applicable. Field trips required, approximate cost $40.00.
Prerequisites, L.A. 553 (153) and 554 (154).
Credit, 4 each semester. Mr. Procopio.

584 (184). PRESENTATION.
Preparation and rendering of landscape and architectural plans, elevations, perspectives, etc. *Credit, 2.* Mr. Kent.

590 (196). PROFESSIONAL PRACTICE.
Seminar on the methods and procedures of the professional office.
Credit, 1. Mr. Otto.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Landscape Architecture)

525 (155). CONSTRUCTION DETAILS.
A series of problems in architectural garden features as walks, steps, walls, fences, pools and small structures. *Credit, 4.* Mr. Procopio.

553 (153). INTERMEDIATE DESIGN.
Projects involving the fundamentals of landscape design integrating theory, analysis, research, application and graphics.
Prerequisites, Landscape Architecture 102 (2) and 128 (28).
Credit, 4. Mr. Kent.

554 (154). INTERMEDIATE DESIGN.
Spatial organization, intuitive aspects of design, and perceptual studies within comprehensive projects. Field trip required, approximate cost $40.00.
Prerequisites, L.A. 124 (24) and 553 (153). *Credit, 4.* Mr. Kent.

FOR THE DEGREE OF BACHELOR OF LANDSCAPE ARCHITECTURE

To receive this professional bachelor's degree, each candidate will be required:

1. To have received the degree of Bachelor of Science or Bachelor of Arts from a recognized institution.
2. To have completed as a prerequisite 24 semester credits in landscape architecture, substantially equivalent to the technical courses now required in the undergraduate major in landscape architecture at this university.
3. In addition, to have completed in residence at this institution, 30 credits in landscape architecture and closely related subjects prescribed by the department. (See Fifth Year Program below.)
4. To have received the unanimous approval of the faculty of the department and the vote of approval of the faculty of the Graduate School.

FIFTH YEAR PROGRAM

The regular program of studies for the Fifth Year, subject to minor changes dependent upon courses taken previously, is as follows:

First Semester

701 (201). General Design.
Class A Exchange problems and advanced local projects. *Credit, 5.* Mr. Otto.

703 (203). Ecology and Physiography.
Plant associations as related to ground forms and conditions. *Credit, 3.* Mr. Mosher.

705 (205). Architecture.
Studies in principles and problems of architectural design. *Credit, 3.* Mr. Kantianis.

707 (207). Contracts, Specifications, Estimating Costs.
Preparation of supporting data for proposed plans. *Credit, 3.* Mr. Hamilton.

709 (209). Seminar.
Special training in the theory and philosophy of the creative art professions through research and discussions. *Credit, 1.* Mr. Kent.

Second Semester

702 (202). General Design.
Continuation of 201. *Credit, 5.* Mr. Otto.

706 (206). Architecture.
Studies in principles and problems of architectural design. *Credit, 3.* Mr. Kantianis.

708 (204). Construction.
Problems in landscape construction as related to general design. *Credit, 3.* Mr. Procopio.

710 (210). Seminar.
Continuation of L.A. 709. *Credit, 1.* Mr. Kent.

Elective: Suitable subject assigned.

MATHEMATICS

Head of Department
Wayman Strother

Professors
A. E. Anderson
A. G. Azpeitia
H. G. Jacob
E. G. Kundert
R. W. Wagner

Associate Professors
H. F. Cullen
D. J. Dickinson*

Assistant Professors
E. Killam
R. A. McHaffey*
D. S. Stockton

*on leave 1964-65

Special Department Entrance Requirements:

Candidates for admission who plan to major in this department must have completed at least eighteen semester credit hours in undergraduate mathematics beyond the content of Mathematics 173 (29) and 174 (30) (Differential and Integral Calculus).

A one-year course in Modern Algebra and a one-year course in advanced, theoretical calculus would be desirable. Both of these courses as well as a course in Sets and Ordered Structures are necessary, before entrance to graduate school, if a student is to complete the work of a Master's degree in one year.

Special Degree Requirements:

The following courses, or equivalent courses taken elsewhere are required for a Master's degree: 211 (53), 212 (54) (no graduate credit for Mathematics majors), 625 (185), 626 (186), 671 (188), 771 (241), 711 (201); either 723 (221) or 721 (227); one of the four courses 712 (202), 724 (222), 722 (228), 772 (242).

A total of 30 graduate credit-hours is required of which not more than six credit-hours may be taken in other departments. The choice of courses taken in other departments is subject to the approval of this department.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Topics Course.
Topics may be chosen from the fields of algebra, geometry, theory of functions, topology, and applied mathematics.
Prerequisite, permission of instructor. *Credit, 1, 2, 3.* The Staff.

711, 712 (201, 202). Introduction to Modern Algebra.
Axiomatic foundation of algebra, groups, rings, fields and vector spaces; linear transformations and matrices.
Prerequisite, Mathematics 512 (154). *Credit, 3 each semester.* The Staff.

721 (227). THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.
Holomorphic functions, power series and complex integration, singularities, series and infinite products of holomorphic functions, entire and meromorphic functions.
Prerequisites, Mathematics 771 (241) and 626 (186). *Credit, 3.* The Staff.

722 (228). THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.
Topics selected from: Conformal mappings, Riemann surfaces, special functions, Laplace and Fourier series and transforms, differential equations and boundary value problems. Physical applications.
Prerequisite, Mathematics 721 (227). *Credit, 3.* The Staff.

723, 724 (221, 222). THEORY OF FUNCTIONS OF A REAL VARIABLE.
Limits, continuity and differentiability of functions of one and two real variables, theories of integration, sequences of functions.
Prerequisite, Mathematics 771 (241). *Credit, 3 each semester.* The Staff.

725 (224). INTRODUCTION TO FUNCTIONAL ANALYSIS.
Banach and Hilbert spaces, continuous linear operators, spectral theory, Banach algebras.
Prerequisites, Mathematics 512 (154) and 771 (241). *Credit, 3.* The Staff.

771 (241). TOPOLOGY I — INTRODUCTION TO GENERAL TOPOLOGY.
Topological, Hausdorff and metric spaces; homeomorphisms; connectivity and compactness.
Prerequisites, Mathematics 625 (185) and 671 (188). *Credit, 3.* The Staff.

772 (242). TOPOLOGY II — INTRODUCTION TO ALGEBRAIC TOPOLOGY.
Simplexes, complexes, homology and homotopy.
Prerequisite, Mathematics 771 (241). *Credit, 3.* The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

551 (183). NUMERICAL ANALYSIS.
Approximation and error evaluation; finite differences; approximation by polynomials using finite difference methods and minimal criteria; special reference to sets of orthogonal polynomials.
Three class hours.
Prerequisites, Mathematics 186 (32) or 174 (26); Computer Science 21 (may be taken concurrently). *Credit, 3.* The Staff.

552 (184). NUMERICAL ANALYSIS.
Evaluation of definite integrals; solution of differential equations, polynomial equations, other conditional equations, and systems of linear equations with related matrix manipulations.
Three class hours.
Prerequisites, Mathematics 551 (183) and 541 (192) or 186 (32).
Credit, 3. The Staff.

611 (168). Linear Algebra.
Row equivalence, Linear transformations and matrices. Similarity, invariant subspace, canonical forms. Inner product spaces, linear functions, the spectral theorem.
Bilinear forms.
Three class hours.
Prerequisite, Mathematics 512 (154) or 513 (152). *Credit, 3.* The Staff.

612 (169). Theory of Groups and Group Representations.
Axiom systems, Lagrange theorem, generators, relations. Conjugate classes, normal subgroups, quotient groups. Sylow theorems. Abelian groups. Unitary and irreducible representations. Characters, orthogonality relations.
Three class hours.
Prerequisite, Mathematics 611 (168). *Credit, 3.* The Staff.

613 (174). Theory of Numbers.
Euclid's algorithm, theory of prime numbers, aliquot parts, congruences, further topics in number theory.
Three class hours.
Prerequisite, Mathematics 511 (153). *Credit, 3.* The Staff.

625 (185). Introductory Modern Analysis.
Real and complex numbers. Basic topology of the real number system. Limit and continuity. Differentiation. Partial differentiation.
Three class hours.
Prerequisite, Mathematics 174 (26). *Credit, 3.* The Staff.

626 (186). Introductory Modern Analysis.
Bounded variation. Riemann-Stieltjes integration. Multiple integrals. Line integrals. Infinite series. Sequences of functions. Improper Riemann-Stieltjes integrals.
Three class hours.
Prerequisite, Mathematics 625 (185). *Credit, 3.* The Staff.

641 (193). Fourier Series and Orthogonal Functions.
Solutions of boundary value problems by Fourier series, Bessel functions, Legendre polynomials; convergence of representations by orthogonal functions.
Three class hours.
Prerequisite, Mathematics 541 (192) or 186 (32). *Credit, 3.* The Staff.

661 (161). Projective Geometry.
A study, from both the synthetic and analytic viewpoints, of properties invariant under projection, with emphasis on the real plane. Equivalence of Desarguesian and coordinate projective geometries.
Three class hours.
Prerequisite, Mathematics 511 (153). *Credit, 3.* The Staff.

662 (162). Higher Geometry.
A study along the lines of Klein's *Erlanger Programm* of various geometries and their groups of transformations, emphasizing Projective, Affine, and Euclidean.
Three class hours.
Prerequisites, Mathematics 512 (154) and 661 (161), or permission of instructor. *Credit, 3.* The Staff.

671 (188). Sets and Ordered Structures.
Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic.
Three class hours.
Prerequisite, Math 625 (185) or permission. *Credit, 3.* The Staff

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Mathematics)

505 (155). Mathematics of Finance.
The mathematical principles of simple and compound interest, annuities, depreciation, valuation of bonds, and insurance, May not be counted for Mathematics major credit.
Three class hours.
Prerequisite, Mathematics 111 (1), 135 (5) or 121 (7).
Credit, 3. The Staff.

511 (153). Introduction to Modern Algebra.
Basic concepts, groups, rings, the real and complex fields.
Three class hours.
Prerequisite, Mathematics 174 (26) or 185 (31), or permission.
Credit, 3. The Staff.

512 (154). Continuation of Mathematics 511 (153).
Polynomials, cyclic groups, finite demensional vector spaces, linear transformations, elementary theory of matrices and determinants.
Three class hours.
Prerequisite, Mathematics 511 (153). *Credit, 3.* The Staff.

513 (152). Introduction to Vector Spaces and Groups.
The last two-thirds of Mathematics 512 (154). Finite demensional vector spaces, linear transformations, elementary theory of matrices and determinants.
Three class hours for the last two-thirds of a semester.
Prerequisite, Mathematics 123 (9) or permission of the department head.
Credit, 2. The Staff.

521 (171). Vector Analysis.
The Algebra and Calculus of vectors. Applications to Physics and other fields will be considered.
Three class hours.
Prerequisite, Physics 104 (4) or 106 (6); corequisite, Mathematics 185 (31) or 174 (26). *Credit, 3.* The Staff.

541 (192). Differential Equations.
Three class hours.
Prerequisite, Mathematics 174 (26). *Credit, 3.* The Staff.

557 (157). Linear Programming and Theory of Games.
Topics include sets, probability, vectors, matrices, and an introduction to linear programming and theory of games.
Three class hours.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

585 (175). Advanced Engineering Mathematics.
Series solution of differential equations, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in Mathematics.
Three class hours.
Prerequisite, Mathematics 541 (192) or 186 (32). *Credit, 3.* The Staff.

586 (176). Advanced Engineering Mathematics.
Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in mathematics.
Three class hours.
Prerequisite, Mathematics 541 192) or 186 (32). *Credit, 3.* The Staff.

621 (181). Complex Analysis.
The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration. Taylors series, and residues.
Three class hours.
Prerequisite, Mathematics 541 (192) or 186 (32). *Credit, 3.* The Staff.

MECHANICAL AND INDUSTRIAL ENGINEERING

GRADUATE FACULTY

Head of Department
W. H. Weaver

Professors
M. E. Bates
J. H. Dittfach
J. D. Swenson

Commonwealth Professor
C. A. Keyser

Associate Professors
R. W. Day
J. M. O'Byrne
R. K. Patterson
E. J. Rising
D. Sobala
R. W. Trueswell

Mechanical Engineering

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major and minor credit)

700 (200). Special Problems in Mechanical Engineering.
Special investigational or research problems, the scope to be varied to meet specific conditions.
Prerequisite, as required by the problem. *Credit, 1-6.* The Staff.

701 (201). Advanced Thermodynamics.
A detailed treatment of the first and second laws and a selection of advanced topics to fit individual needs.
Prerequisite, M.E. 287 (87). *Credit, 3.* The Staff.

711 (211). Theory of Power Machines.
Advanced thermodynamic study applied to heat power equipment such as gasoline and Diesel engines, steam and gas turbines, rotary and reciprocating compressors, jet propulsion, and rockets.
Prerequisites, M.E. 577 (177) and 584 (184). *Credit, 3.* The Staff.

721 (221). Advanced Heat Transfer.
Advanced topics in heat transfer.
Prerequisite, M.E. 582 (182). *Credit, 3.* The Staff.

741 (241). Advanced Dynamics.
Vibration and stability of systems with many degrees of freedom, normal modes and frequencies; approximate methods. Nonlinear systems, self excited vibrations. Gyroscopic effects in mechanical systems. Selected topics with application to problems in engineering.
Prerequisite, M.E. 585 (185). *Credit, 3.* Mr. White and Mr. Sobala.

751 (251). Advanced Topics in Machine Design.
Application of advanced theories to Machine Design and Kinematics. A variety of topics and considerable creative work are included.
Prerequisite, M.E. 583 (183) and 586 (186). *Credit, 3.* Mr. Bates.

800 (300). Thesis, Master's Degree. *Credit, 3-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

404 (104). Mechanical Drawing in High School.
Discussion of course material for pre-engineering high school mechanical drawing courses. Theory and laboratory practice.
Limit: 30 participants (Summer School). *Credit, 3.*

550 (150). Fundamentals of Metallurgy.
Physical metallurgy involving crystal structure, solid solutions, diffusion in the solid state, freezing of metals, hardening of metals, annealing, and equilibrium diagrams. Fundaments are applied to the study of the iron-iron carbide diagram, the S-curve, heat treatment of steel and the properties and uses of the other principal engineering metals. Laboratory work stresses metallographic technique. Two class hours, one 3-hour laboratory period.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 135 (35) or Chemistry 586 (166). *Credit, 3.* The Staff.

568 (168). Kinematics.
Principles of mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions.
Two class hours, one 3-hour laboratory period.
Prerequisites, M.E. 101 (1) and C.E. 252 (52). *Credit, 3.* The Staff.

574 (174). Basic Aerodynamics.
An introduction of the basic concepts of applied aerodynamics, for the student who has no previous background in the subject. Topics include properties of air, ideal fluid flow, airfoils and their properties, aircraft performance and stability.
Three class hours.
Prerequisite, C.E. 276 (76). *Credit, 3.* Mr. Sobala.

575 (175). Steam Power Plants.
A study of steam power plants, including boilers, stokers, fuels, combustion, steam generation, prime movers, auxiliary equipment, and problems involved in design and operation.
Three class hours.
Prerequisite, M.E. 264 (64). *Credit, 3.* Mr. Swenson.

576 (176). Refrigeration and Air Conditioning.
The fundamental principles of thermodynamics as applied to refrigeration and air conditioning. Application of refrigeration to industrial processes and the control of temperature, humidity and motion of air in buildings.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 264 (64). *Credit, 3.* Mr. Swenson.

577 (177.) Internal Combustion Engines.
The thermodynamic and performance aspects of reciprocating gasoline and Diesel engines, steady flow gas turbines and turbo-jet engines, and rockets are major topics.
Three class hours.
Prerequisite, M.E. 264 (64). *Credit, 3.* Mr. Dittfach.

582 (182). Heat Transfer.
Methods of evaluating heat transfer rates and predicting operating temperatures. Heat transfer by conduction, radiation, and convection. Topics include one- and two-dimensional conduction, heat flow, transient heat flow, fins, numerical and graphical solutions, free and forced convection and radiation.
Three class hours.
Prerequisites, M.E. 264 (64) and Mathematics 186 (32) or 541 (192).
Credit, 3. Mr. O'Byrne.

583 (183). Machine Design.
Principles involved in the design of various machine parts. Related topics included such as economy of manufacture, safety, styling, invention, and creativity.
Two class hours, one 3-hour laboratory period.
Prerequisites, C.E. 253 (53) and M.E. 568 (168).
Credit, 3. Mr. Bates and Mr. Patterson.

584 (184). Basic Engineering Analysis.
The application of mathematical methods to the solution of mechanical engineering problems in such fields as vibrations, elasticity, fluid mechanics, and dynamics. The analysis of the problems and the derivation of the governing equations.
Three class hours.
Prerequisites, M.E. 585 (185), Mathematics 186 (32) or 541 (192).
Credit, 3. The Staff.

585 (185). Dynamics of Machinery.
Elements of vibration theory, vibration isolation, vibration analysis of equivalent masses and shaft systems. Vibration absorbers of dynamics balancing. Students may schedule the course without the laboratory (3 cr.) or with the laboratory (4 cr.).
Three class hours, one 3-hour laboratory period.
Prerequisites, C.E. 252 (52) and M.E. 568 (168). *Credit, 3-4.* Mr. Sobala

586 (186). Advanced Machine Design.
A continuation of Course 563 (183). Additional elementary parts are analyzed, and some complete machines are studied. Considerable emphasis on invention and creativity.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 583 (183). *Credit, 3.* Mr. Bates and Mr. Patterson.

587 (187). Engineering Thermodynamics III.
Topics investigated include combustion and gas dynamics with emphasis on one dimensional flow with normal and oblique shock.
Three class hours.
Prerequisites, Math 186 (32) and M.E. 264 (64). *Credit, 3.* The Staff.

590 (190). Advanced Metallurgy.
Advanced topics in metallurgy including the structure of metals and recent metallurgical developments.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 550 (150). *Credit, 3.* The Staff.

597 (197). Experimental Mechanical Engineering.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

Industrial Engineering

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Industrial Engineering.
Special investigational or research problems in industrial engineering, the scope to be varied to meet specific conditions.
Prerequisite as required by the problem. *Credit, 1-6.* The Staff.

753 (253). Methods of Measurement of Human Work.
A critical study of the assumptions in measuring human effort in industry including the problems present in rating, predetermined data systems, the use of the high speed camera in securing data.
Three class hours.
Prerequisite, I.E. 253 (53) and 272 (72) or comparable courses.
Credit, 3. The Staff.

754 (254). Advanced Topics in Engineering Economy.
A more intensive study of the basic subject field of engineering economy as stated in I.E. 254 (54).
Three class hours.
Prerequisite, I.E. 254 (54) or a similar basic course in engineering economy.
Credit, 3. The Staff.

756 (256). Advanced Topics in Data Processing.
Probability theory and information theory, components and operation of analog and digital computers, the analysis of large scale data processing systems as applied to the functioning of industrial control systems.
Three class hours.
Prerequisite, I.E. 256 (56) or a similar basic course in data processing principles and applications. *Credit, 3.* The Staff.

777 (277). Manufacturing Control.
A quantitative approach to decision making in production management. Incremental analysis, linear programming, waiting line theory, statistics as applied to problems of economic quantity planning, production programming, statistical control and equipment purchase.
Three class hours.
Prerequisite, basic knowledge of statistics and the principles of operations research. *Credit, 3.* The Staff.

779 (279). Quantitative Methods in Industrial Engineering.
The application of mathematical concepts and the prinicples of operations research and probability to various Industrial Engineering problems. The theoretical background will be presented, demonstrated by example and applied by exercises and case problems.
Three class hours.
Prerequisite, a basic knowledge of statistics and the principles of operations research. *Credit, 3.* The Staff.

800 (300). Thesis, Master's Degree.
Credit, 3-10.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

553 (153). Methods and Standards Engineering.
The priniciples involved in the simplification of the work pattern and the design of the work place, and in the establishment of production standards for industrial engineering students.
Three class hours, one 3-hour laboratory period.
Prerequisite, I.E. 271 (71), previously or concurrently. *Credit, 4.* The Staff.

554 (154). Engineering Economy.
A study of the bases for comparison of alternatives in engineering projects, break-even and minimum cost points, evaluation of proposals for new activities, economy of operations, the evaluation of public activities, the output and life of typical items of engineering and industrial equipment, manufacturing lot sizes, economic purchase quantities, the selection and replacement of structures and machines.
Three class hours.
Prerequisites, Economics 125 (25), Mathematics 106 (6), and Industrial Engineering 579 (179). *Credit, 3.* The Staff.

556 (156). Analysis of Data Processing Systems.
Principles and applications of data processing and electronic computer systems for use by Industrial Engineers as a management tool for control and decision making.
Three class hours.
Prerequisite, approval of instructor. *Credit, 3.* The Staff.

I.E. 571 (171). Basic Probability for Engineers.
A study of probability and its applications to engineering which utilizes calculus to examine frequency, density and cumulative distribution functions. Distributions such as chi square, normal, binomial, etc. are treated. Hypothesis testing will be included.
Three class hours.
Prerequisites, Math 106 (6). *Credit, 3.* The Staff.

572 (172). Principles of Engineering Statistics.
A study of statistical principles as applied to engineering problems including: analysis of variances, design of experiments, sampling plans, statistical quality control.
Three class hours.
Prerequisite, a basic course in statistics comparable to I.E. 271 (71).
Credit, 3. The Staff.

575 (175). Job Evaluation.
The prinicples used to determine an evaluation of all occupations in order to establish an equitable rating between them, to establish sound wage and salary policies.
Two class hours.
Prerequisite, I.E. 251 (51). *Credit, 2.* The Staff.

576 (176). Time Study.
The principles involved in the establishment of production standards and their application in the management functions of cost accounting, estimating, production control, incentives, budgetary control.
Prerequisites, I.E. 575 (175), 582 (182) concurrently except for Business Administration majors. *Credit, 3.* The Staff.

577 (177). Factory Planning and Lay-out.
The principles applying to the determination and development of the physical relationship between plant equipment and operators working toward the highest degree of economy and effectiveness in operation.
One class hour, one 3-hour laboratory period.
Prerequisites, M.E. 102 (2) and I.E. 251 (51). *Credit, 2.* The Staff.

578 (178). Production Control.
The principles used to regulate production activities in keeping with the manufacturing plan.
Three class hours.
Prerequisites, I.E. 251 (51). *Credit, 3.* The Staff.

579 (179). Industrial Engineering Problems.
The principles of statistics, theory of probability, theory of games, principles of linear programming applied to solutions of problems in inventory control, costing, production control, quality control, production standards, work measurement, delay allowances.
Three class hours.
Prerequisites, Mathematics I.E. 571 (57), and I.E. 253 (53).
Credit, 3. The Staff.

580 (180). Plant Budgetary Control.
The principles used to predetermine expenses for the factors of production and the comparison of results with the estimates to determine and deal with the causes of expense variations as applied by the operating organization in the industrial plant.
Three class hours.
Prerequisites, I.E. 251 (51). *Credit, 3.* The Staff.

582 (182). Work Simplification.
The principles involved in the simplification of means of doing work and in the application and use of these principles.
One class hour, one 3-hour laboratory period.
Prerequisites, M.E. 568 (168) and I.E. 576 (176) concurrently.
Credit, 2. The Staff.

MICROBIOLOGY

GRADUATE FACULTY

Head of Department
C. D. Cox

Assistant Professors
E. Canale-Parola
R. P. Mortlock
C. J. Pfau

The Department of Microbiology provides facilities for students intending to complete the requirements for the Master of Science and Doctor of Philosophy degrees. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those students considered by the Department to be deficient in cognate sciences may be accepted as graduate student majors in microbiology and their deficiences removed during graduate study. Extensive advanced undergraduate courses in microbiology are not as essential as undergraduate background in chemistry, biological sciences, mathematics and physics, in preparation for graduate work in microbiology. Satisfactory knowledge of microbiology and cognate sciences is required for admission to advanced courses in microbiology.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (290). Research.
Not for thesis credit, but normally for research preliminary to registration for thesis credit. May be repeated for a total of no more than 9 credits for a Master's degree or 18 credits for a Doctor's degree. Permission of the instructor required. *Credit, 2-6 each semester.* The Staff.

710 (205). Advanced Immunology.
Advanced theories and laboratory procedures basic to immunology and serology.
Permission of the instructor required. *Credit, 3-6.* The Staff.

720 (257). Mammalian Virology.
The structure, and the chemical, physical and biological properties of viruses with emphasis on mammalian viruses. Laboratory treatment includes technics of propagation and study, including tissue culture.
Permission of the instructor required. *Credit, 4.* Mr. Pfau.

730 (206). Microbial Fermentations.
Theories, methods, and processes by which various chemicals and biological materials are produced industrially through the action of microorganisms. The laboratory experiments consider the microorganisms involved, procedures used, and the chemistry of the fermentation reactions.
Permission of the instructor required. *Credit, 3.* Mr. Czarnecki.

735 (213). Antibiotics.
The historical background and theory of action of antibiotics are correlated with practical laboratory procedures used in the study of their isolation, methods of assay, and effects on morphology and survival of bacteria.
Permission of the instructor required. *Credit, 3.* Mr. Czarnecki.

740 (266). Advanced Microbial Physiology.
Similar to Microbiology 640 (166) except more intensive treatment of specific areas dictated by particular research interests and requirements of the student.
Permission of the instructor required. *Credit, 2-5.* The Staff.

750 (203). Microbial Cytology.
Lectures, literature reviews, and laboratory demonstrations, designed to give the student a comprehensive survey of the structure of microbial cells and the functions of their components.
Permission of the instructor required. *Credit, 3-5.* The Staff.

760 (267). Microbial Metabolism.
Metabolic pathways and mechanisms in microorganisms. Lectures, readings and discussions.
Permission of the instructor required. *Credit, 3.* Mr. Mortlock.

770 (214). Microbial Genetics.
Inheritance and variation in microorganisms. Mechanisms of recombination, transformation, transduction and other genetic phenomena in microorganisms, with emphasis on molecular basis.
Permission of the instructor required. *Credit, 4.* The Staff.

780 (254). Host-Parasite Relationships.
Intensive treatment of specific relationships between parasitic microorganisms and their hosts, by appropriate literature and laboratory studies.
Permission of the instructor required. *Credit, 2-5.* The Staff.

790 (208). Seminar.
Reports and discussions of pertinent literature. Normally required of all graduate majors each semester in residence. *Credit, 1.* The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

890 (210). Current Topics.
Intensive consideration of a specific microbiological topic of current interest, utilizing staff and student participation and visiting scientists. Lectures and discussions only. Credit depends upon particular topic each semester given.
Permission of the instructor required. *Credit, 1-2.* The Staff.

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

550 (151). General Microbiology I.
General considerations of microbial structure, growth and physiology, and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and other science majors.
Two class hours, two 3-hour laboratory periods.
Prerequisites, organic chemistry or concurrent registration, and one semester of biological science. *Credit, 4.* Mr. Canale-Parola, Mr. Mortlock.

560 (164). General Microbiology II.
Principles of selective enrichment and isolation; morphological, physiological and ecological characteristics of a number of microbial groups isolated from nature.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550 (151), or microbiology 150 (1) and organic chemistry. *Credit, 4.* Mr. Canale-Parola.

580 (154). Pathogenic Bacteriology.
Correlation of physiologic and metabolic properties and processes of bacteria with the pathogenesis of disease.
Prerequisite, Microbiology 150 (1) or 550 (151). *Credit, 4.* Mr. Cox.

610 (155). Immunology.
Fundamental study of the nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550 (151), or Microbiology 150 (1) and organic chemistry. *Credit, 4.* Mr. Cox.

620 (157). Virology.
The structure, and the chemical, physical and biological properties of viruses, with emphasis on the bacterial viruses.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550 (151), or permission of the instructor.
Credit, 4. Mr. Pfau.

640 (166). Microbial Physiology.
Fundamental study of the growth, nutrition, metabolism and respiration of microorganisms.
Prerequisites, Microbiology 550 (151), or permission of the instructor.
Credit, 4. Mr. Mortlock.

PHILOSOPHY

GRADUATE FACULTY

Head of Department
C. Shute

Professors
Edward C. Moore (Dean of The Graduate School and Research Professor of Philosophy)
F. E. Oppenheim (Government)

Associate Professor
J. W. Swanson

Assistant Professors
J. A. Brentlinger
L. H. Ehrlich

Students are advised to consult the departmental office prior to preregistration for a list and detailed descriptions of scheduled graduate courses.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)
Each course numbered above 700 is conducted as a seminar.

700 (200). Research and Reading in Philosophy.
Independent graduate research on specific topics in philosophy under the supervision of a faculty member.
Prerequisite, permission of the department.
Credit, 2-6. Maximum credit, 6. The Staff.

710, 711 (251, 252). Selected Philosophers.
Each semester a leading philosopher will be chosen for intensive reading.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

720. (258). Kant.
The *Critique of Pure Reason* will be read in its relation to Kant's philosophy as a whole.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ehrlich.

745. (241). Ethical Theory.
Analysis of selected problems of normative and meta-ethics involved in contemporary development of ethical theory.
Prerequisite, permission of instructor. *Credit, 3.* Miss Ferguson.

750 (266). Philosophy of Education.
An evaluation of various educational theories and practices on the different levels viewed in the light of historical perspective and contemporary thought.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ehrlich.

755 (281). Philosophy of Language.
An inquiry into the nature of language, meaning, reference, communication and translation. Topics include the later Wittgenstein, Quine's contextualism, the Whorf-Sapir hypothesis, problems in psycholinguistics.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Swanson.

760 (285). Metaphysics.
The leading issues in contemporary debate on the nature and limits of metaphysical theory; examination of metaphysical concepts in relation to their use and treatment by other disciplines.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Brentlinger.

765 (286). Theory of Knowledge.
A study of perception, subject-object relation, origins of knowledge, concept formation and language, the analytic-synthetic distinction, limits of empiricism and rationalism, relation of epistemology to metaphysics.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Swanson.

780, 781 (261, 262). Problems in the History of Ideas.
An inquiry into a distinct major philosophical problem or group of related philosophical problems.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

790, 791 (295, 296). Seminar.
Conferences and reports on special studies in philosophy.
Credit, 1-3. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 6-10.*

900. Doctoral Dissertation *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Prerequisites. The prerequisites listed are those normally required of undergraduate students. They may be waived by the instructor for graduate students with adequate preparation.

501 (153). Plato and Aristotle.
The major works of Plato and Aristotle in ethics, logic, and metaphysics will be read for the systematic character of their thought and its contemporary relevance. *Credit, 2-3.* Mr. Brentlinger.

502 (154). Philosophy in the Middle Ages.
The writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought. *Credit, 2-3.* Mr. Ehrlich.

503 (155). European Philosophy from Montaigne to Rousseau.
A study of representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal. *Credit, 3.* Mr. Ehrlich.

504 (156). British Philosophy from Bacon to Hume.
A study of representative philosophical texts, with emphasis on Locke, Berkeley, and Hume, and their historical influence, especially on contemporary empiricism. *Credit, 3.* Mr. Clay.

518 (167). American Philosophy.
Examination by means of a study of selected original texts by the outstanding American philosophers, of their contribution to Western thought and American civilization. *Credit, 2-3.* Mr. Moore

525 (267). Indian Philosophies.
Theories of reality, of knowledge, of art, and of human destiny in the leading schools of Indian Asia; traditional and contemporary political theory.
Credit, 2-3. Mr. Shute.

526 (268). Far Eastern Philosophies.
Theories of human nature, society, and the state in philosophies of Chinese and Japanese origin; the modification of Buddhism under the influence of Chinese thought. *Credit, 2-3.* Mr. Shute.

530 (172). Philosophy of Science.
A critical analysis of the structure of scientific method and the language of science, the respective roles of induction and deduction in science, and the status of theoretical terms. *Credit, 2-3.* Mr. Swanson.

541. (181). Philosophy of Religion.
Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience. *Credit, 2-3.* Mr. Shute.

543 (182). Aesthetics.
Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism. *Credit, 2-3.* Mr. Shute.

561 (161). Contemporary Analytic Philosophy.
Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine
Prerequisite, one semester course in philosophy. *Credit, 3.* Mr. Clay.

564 (164). Existential Philosophies.
Examination, by means of a study of selected original texts, of the main problems peculiar to this movement as a whole and to its main exponents individually.
Prerequisite, one semester course in philosophy other than 31.
Credit, 3. Mr. Ehrlich.

581 (175). Mathematical Logic.
Turing machines, theory of computability, effective procedures, combinatorial systems, natural deduction, completeness of quantification theory.
Prerequisite, Philosophy 31 or consent of the instructor.
Credit, 3. Mr. Clay.

582 (176). Theory of Formal Systems.
Equivalence, completeness, incompleteness, decision procedure, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic.
Prerequisite, Philosophy 75, its equivalent, or the instructor's approval.
Credit, 3. Mr. Clay.

590 (184). Political Philosophy.
A systematic approach to major controversies of political science and political ethics; e.g. rationalism vs. empiricism, natural law vs. legal positivism.
Prerequisite, one semester course in philosophy. *Credit, 3.* Mr. Oppenheim.

595 (192). Contemporary Problems.
A consideration of selected persistent philosophical problems—e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc.
Prerequisite, two semester courses in philosophy. *Credit, 2-3.* Mr. Clay

690, 691 (195, 196). Seminar.
A study of one major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry.
Prerequisite, two semester courses in philosophy and the permission of the instructor. *Credit, 3.* The Staff.

PHYSICAL EDUCATION

Dean
W. P. McGuirk

Assistant Dean
D. C. Bischoff

Professor
Miss M. A. Coffey

Associate Professors
Miss E. V. Hubbard
B. Ricci, Jr.
Miss C. L. Vendien

The School of Physical Education offers a M.S. in Physical Education. The following school requirements for admission to the Graduate Physical Education Program are in addition to the University requirements for admission:

1. Thirty semester hours of Physical Education, including student teaching, or twenty-four semester hours without student teaching, accompanied by evidence of successful salaried teaching in which Physical Education was included. Kinesiology, Physiology of Exercise, Tests and Measurements, Adapted Physical Education, and Philosophy of Physical Education, or their content equivalents, shall be included. In the event any of these requirements have not been satisfied, the applicant will be required to complete his deficiencies without graduate credit.
2. A medical examination presenting evidence of good physical condition.
3. Evidence of proficiency in physical activities. The candidate will be required to demonstrate a high level of competency in four activities that he may choose from those activities offered in the Physical Education Programs at the University of Massachusetts.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

701 (201). Research Methods in Physical Education.
Experimental, historical, descriptive, and philosophical methods of research. Identification and comparison of methods in significant research studies. Required. *Credit, 3.* Mr. Ricci.

702 (202). Contemporary Problems in Physical Education.
Seminar, review, analysis, and evaluation of contemporary problems. Required. A broad review of literature combined with critical analysis of selected items.
Credit, 3. Miss Hubbard.

703 (203). Philosophy of Physical Education.
An investigation of the attitudes toward and contributions of physical education in the evolution of educational thought. Required.
Prerequisite, Physical Education 276 (76) or its equivalent.
Credit, 3. Mr. Bischoff.

724 (224). Supervision of Physical Education Programs.
A description and evaluation of creative leadership responsibilities of the teacher or administrator in a supervisory capacity. Special emphasis will be given to analysis of duties, cooperative relationships, research, and new techniques. *Credit, 3.* Miss Vendien.

727 (227). Comparative Physical Education and Athletics.
A comparative analysis of physical education and athletics in selected countries. Special emphasis will be given to historical, cultural, and social values affecting the status of sports and recreation, and current international cooperation.
Credit 3. Miss Vendien.

735 (235). Biomechanics.
Physical and biological considerations applied to the teaching of motor skills.
Prerequisite, Physical Education 142 (42) or its equivalent.
Credit, 3. Mr. James.

736 (236). Experimental Physiology of Exercise.
The experimental investigation of the physiological effects of exercise.
Prerequisite, Physical Education 278 (78) or its equivalent.
Credit, 3. Mr. Ricci.

738 (238). Kinesthetic Form.
The problem of the definition of form in movement as it relates to learning.
Credit, 3. Miss Hubbard.

745 (245). Dance Composition.
A survey of various theories of dance composition, providing experience in the composition, presentation, and critical evaluation of dances.
Credit, 3. Miss Roby or Miss Reid.

747 (247). Comparative Theory and Method of Dance Education.
Educational aims of dance. The expressive purpose and formal principles common to various types of dance included in the curriculum; the use of resources provided by the theory and method of leading dance artists.
Credit, 3. Miss Hubbard.

800 (300). Master's Thesis. *Credit, 6.* The Staff.

COURSE FOR MINOR CREDIT ONLY

The following course may not be counted toward the M.S. Degree in Physical Education.

580 (180). Driver Education Instruction Course.
Driver education and driver training at the instructor's level. Leads to certification as instructor in driver education and driver training.
Credit, 3. Mr. Briggs.

PHYSICS

GRADUATE FACULTY

Head of Department
R. L. Gluckstern

Professors
P. Rosen
J. D. Trimmer

Associate Professors
W. D. Foland
P. R. Jones
E. A. Soltysik

Assistant Professors
I. Kang
S. R. Lin
R. A. Patten
K. S. R. Sastry
M. L. Thiebaux

Candidates planning to major in Physics should have completed at least (preferably, more than) fifteen semester credit hours in undergraduate physics beyond an introductory course (such as Physics 105, 106, 107) and also six credits of mathematics beyond a full year of college-level calculus.

Requirements for the Master's Degree include either six credits of work devoted to thesis, or six credits of class work in or above the 700 series instead. A general written examination must be passed before the degree is awarded.

The general requirements for the Ph. D. in Physics are those of the Graduate School. These are implemented along the following lines. A student takes a normal load of basic courses during the first two years. After passing the qualifying examination the student will be expected to devote his major effort to research. Courses taken during this period will usually be in the student's research field. The basic courses of the program are 566, 597, 598, 701, 702, 703, 704, 711, 712, 713, 714, 716, 719, or 721, 801, 802, 803 and 804.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700 (200). Special Problems.

Credit, 1-6. The Staff.

701, 702 (201, 202). Theoretical Physics.
Topics in theoretical physics, with emphasis on classical mechanics (methods of Lagrange, Hamilton, and Jacobi) and on electromagnetic fields in continuous media.
Prerequisites, Physics 552 (152) and 556 (156) and Mathematics 241 (92).
Credit, 3 each semester. Mr. Kang.

703, 704 (203, 204). Methods of Mathematical Physics.
Selected topics with applications to physics in vector and tensor analysis, vector spaces, Hilbert spaces and integral transforms, complex variables, Green's functions, partial differential equations.
Prerequisite, Mathematics 625 (185) or consent of instructor.
Credit, 3 each semester. Mr. Foland.

711, 712 (211, 212). Quantum Theory.
Elements of wave mechanics, matrix mechanics, and transformation theory. Applications in atomic and nuclear physics.
Prerequisites, Physics 701 (201) for 711 (211), Physics 711 (211) for 712 (212). *Credit, 3 each semester.* Mr. Soltysik.

713. Statistical Physics.
Survey of thermodynamics, Boltzmann distribution, statistical interpretation of thermodynamics, Gibbsian ensembles and the method of Darwin, Fowler; quantum distributions and their applications, transport phenomena.
Prerequisites, Physics 701 (201), 702 (202). *Credit, 3.*

714. Classical Electrodynamics.
The field of a moving charge. The Lienard-Wiechert potentials. Lorentz transformation and special relativity. Covariant formulation of Maxwell's equations. Radiation of electromagnetic waves. The near field and far field. Radiation damping and self fields. Spectral resolution of radiation. Magnetohydrodynamics and plasma physics. Collisions, scattering and absorption.
Prerequisites, Physics 701 (201), 702 (202). *Credit, 3.*

716. Solid State.
Symmetry properties of crystals; crystalline field theory; magnetic properties, quasi-free electron theory; Brillouin zones; Fermi surfaces.
Prerequisites, Physics 701 (201), 702 (202), 711 (211). *Credit, 3.*

717. Relativity.
Mathematical and conceptual aspects of the special and general theories of relativity. Lorentz transformations, covariant formulation of the laws of nature. The equivalence principle, curved spaces, solutions of the equations of relativity.
Prerequisites, Physics 701 (201), 702 (202). *Credit, 3.*

718. Atomic Structure.
An advanced course covering the field of atomic structure including the theory of complex spectra, fine structure, hyperfine structure, electron spin, Zeeman effect, the theory of atomic collisions, general theory of multiplets and magnetic and radiative properties of atoms.
Prerequisites, Physics 711 (211), 712 (212). *Credit, 3.*

719. Nuclear Physics.
Course devoted to basic concepts of nuclear physics, instruments and methods. Topics to be covered include natural radioactivity, nuclear radiations—their properties and interaction with matter, nuclear radiation detectors, electrostatic and magnetic analyzers, mass spectrometry, charged particle accelerators, elementary discussion of alpha and beta decay, nuclear isomerism, internal conversion, nuclear reactions, neutron physics, fission, nuclear spin and magnetic moments, cosmic rays and elementary particles.
Prerequisites, Physics 285, 286. *Credit, 3.*

720. Nuclear Theory.
Course devoted to a theoretical understanding of nuclear structure. Topics include internucleon forces, the deuteron and the two body problem, nuclear models and structure of complex nuclei, electromagnetic properties of nuclei, theory of alpha and beta decay, theory of nuclear reactions.
Prerequisites, Physics 711 (211), 712 (212). *Credit, 3.*

800, (300). Master Thesis. *Credit, 6.*

801, 802. Advanced Quantum Mechanics (I), (II).
Relativistic quantum mechanics of a single particle, Dirac equation, elementary radiation theory, formal scattering theory, field quantization, interacting fields, interaction representation, S matrix. Also Bremsstrahlung, pair production and photoelectric effect. Covariant pertubation theory and Feynman diagrams, and its applications. Renormalizations, dispersion relations, and recent developments.
Prerequisites, Physics 711 (211), 712 (212). *Credit, 6.*

803. Advanced Statistical Physics.
Phase transitions, including condensation; description of imperfect gases. Transport theory and other nonequilibrium phenomena. Irreversible processes. Field theoretic quantum statistical physics.
Prerequisites, Physics 713, 801.

804. Elementary Particle Physics.
Survey of empirical facts; strong, electromagnetic and weak interactions of elementary particles, selection rules, invariance principles and theories of elementary particles.
Prerequisites, Physics 711 (211), 712 (212). *Credit, 3.*

900 (400). Doctoral Dissertation. *Credit, 3.*

COURSES OPEN TO BOTH GRADUATES AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

519. Electronics Instrumentation for Scientists.
A laboratory oriented course designed expressly for physicists and chemists. The course begins with the basic electronic principles and leads systematically through servo systems, operational amplifiers for measurement and control, digital circuits, and other devices used in current laboratory practice.
Prerequisite, permission of instructor. One class hour, one 4-hour laboratory period. *Credit, 3.*

566 (166). Kinetic Theory.
Classical kinetic theory of gases, with an introduction to phenomena in the non-uniform gas.
Prerequisite, Physics 555 (155). *Credit, 3.* Mr. Soltysik.

567 (167). Statistical Mechanics and Information Theory.
A study of the concepts of entropy, information, and order.
Prerequisite, Physics 561. *Credit, 3.* Mr. Trimmer.

585, 586 (185, 186). Modern Physics.
Lectures and problems on Twentieth-century physics, the first semester devoted principally to atomic aspects, the second to nuclear.
Prerequisites, Physics 152 and six other credits in junior-senior physics.
Credit, 3 each semester. Mr. Sastry.

588 (188). Solid State Physics.
An introduction to theoretical and experimental physics of the solid state.
Prerequisite, Physics 585 (185). *Credit, 3.* Mr. Patten.

591 (191). Gaseous Electronics.
Electrical conduction in gases, interactions of space charge and electromagnetic waves, plasmas.
Prerequisite, Physics 552 (152) or equivalent. *Credit, 3.* Mr. Trimmer.

597, 598 (197, 198). Advanced Experimental Work in Selected Topics.
These courses provide experiments adapted to the needs of the individual student, for training in laboratory techniques and methods of measurement.
Two laboratory hours per credit.
Prerequisites, Physics 551 (151), 552 (152) or 555 (155), 556 (156): and Mathematics 173 (25). *Credit, 1-3 each semester.* Mr. Patten.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Physics)

551 (151). Electricity and Magnetism.
The basic laws of electricity and magnetism applied to DC and AC circuits and an introduction to electrical measurements.
Two class hours; one 3-hour laboratory period.
Prerequisites, Physics 104 (4) or 106 (6) or 109 (9); Mathematics 173 (25).
Credit, 3.

552 (152). Electricity and Magnetism.
Classical field theory, conservative force fields, the electrostatic field, the magnetic field of steady currents, time varying fields and Maxwell's equation.
Three class hours.
Prerequisites, Physics 104 (4) or 106 (6) or 109 (9); Mathematics 173 (25).
Credit, 3.

555, 556 (155, 156). Mechanics.
Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation.
Prerequisites, Physics 104 (4) or 107 (7); Mathematics 173 (25).
Credit, 3 each semester. Mr. Rosen.

560 (160). Sound and Acoustics.
Vibrations, coupled systems, sound structure, and acoustic properties; principles and applications.
Prerequisites, Physics 104 (4) or 107 (7); Mathematics 173 (25).
Credit, 3. Mr. Trimmer.

561 (161). Heat and Thermodynamics.
Heat exchanges and related energy changes in systems of matter.
Prerequisites, Physics 104 (4) or 107 (7); Mathematics 173 (25).
Credit, 3.

563 (163). Optics.
An intermediate course in geometrical and physical optics. Two class hours, one 2-hour laboratory period.
Prerequisites, Physics 104 (4) or 107 (7); Mathematics 124 (10).
Credit, 3. Mr. Jones.

PLANT AND SOIL SCIENCES

GRADUATE FACULTY

Head of Department
F. W. Southwick

Professors
A. W. Boicourt
W. C. Colby
M. Drake
J. R. Havis
W. H. Lachman
M. E. Weeks

Associate Professors
W. J. Lord
J. Vengris
W. D. Weeks

Assistant Professors
J. H. Baker
A. V. Barker
W. J. Bramlage
G. B. Goddard
H. V. Marsh
H. B. Gunner
D. N. Maynard
L. F. Michelson

The Department of Plant and Soil Sciences offers doctoral work in Agronomy with majors in either Plant Science or Soil Science. Specialization and thesis problems related to major horticultural and agronomic plants and in soil science are available for both M.S. and Ph.D. degree candidates.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700, 701 (200). Special Problems.
Selected research problems not related to a candidate's thesis.
Credit, 3 each semester. The Staff.

702, 703 (201, 202). Research Literature.
A critical review of the scientific literature in an area of specialization.
Credit, 3 each semester. The Staff.

710. Morphology of Economic Plants (1965-66).
A study of the anatomy of the plant body with emphasis on those structures which have horticultural and agronomic significance.
Prerequisite, Botany 291 (157) or permission of the instructor.
Credit, 3. Mr. Goddard.

720 (Horticulture 276). Advanced Plant Improvement.
Hybridization and selection methods in breeding economic plants; heterosis and its implications; sterility and seed production of F_1 hybrids.
Prerequisites, Plant and Soil Science 540 (162), Zoology 540 (153) or equivalent. *Credit, 3.* Mr. Lachman.

730 (Agronomy 263). Advanced Soil Chemistry.
The chemistry of soil formation, soil acidity, nutrient element availability. ionic exchange, and fixation, soil-plant microorganism relationships, and of organic matter of the soil will be discussed. The laboratory work will consist of physical, analytical and biochemical investigations of soils and important soil constituents.
Prerequisite, permission of the instructor. *Credit, 3.* Mr. Baker.

740 (Agronomy 264). Experimental Methods.
Some of the concepts of the application of statistics to the analysis and interpretation of data obtained in agricultural research. Such points as choice of field, design of experiments, effect of competition, interpretation of results, and other special factors that need to be considered in well planned experiments are discussed.
Prerequisite, permission of the instructor. *Credit, 3.* Mr. Yegian.

790, 791 (291, 292). Seminar.
Required of all graduate students majoring in the department.
Credit, 1 each semester. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 10.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

530. Plant Nutrition (1965-66).
A study of the accumulation and transport of inorganic ions in plants and their function in plant metabolism.
Prerequisite, Botany 211 (67) or equivalent. *Credit, 3.* Mr. Maynard.

535 (Horticulture 154).Taxonomy of Economic Plants.
A study of plant families, genera, species and cultivars of importance in the horticultural and agronomic fields.
Credit, 3. Mr. Boicourt.

540 (Horticulture 162). Plant Breeding.
An advanced study of genetic topics peculiar to plants, together with the methods and problems of the plant breeder.
Prerequisite, Zoology 240 (53) or equivalent. *Credit, 3.* Mr. Lachman.

545. Post-Harvest Physiology (1965-66).
A study of physical and chemical processes of plants before and after harvest and the influence of environmental, chemical and storage factors on these processes. *Credit, 3.* Mr. Bramlage.

550 (Agronomy 152). Forage and Field Crops.
Analysis of the principles involved in the establishment, fertilization, and harvest management of forage and field crops. *Credit, 3.* Mr. Colby.

555 (Agronomy 153). Agrostology.
The establishment and maintenance of turf grasses used on lawns, athletic fields, highways, airports and cemeteries. *Credit, 3.* Mr. Troll.

560 (Agronomy 165). Ecology and Control of Weeds.
Identification and ecology of common weeds and principles of weed control with emphasis on the use of chemical herbicides.
Credit, 3. Mr. Vengris.

565 (Soil Science 157). Soil Formation.
The development of soils as related to physical, chemical, biological climatic and geological factors. *Credit, 3.* Mr. Southwick.

570 (Soil Science 179). Soil Physics (1966-67).
Physical properties of soil, including textural, structural, water, air and temperature relationships; their measurements, evaluation and influence in the soil system.
Prerequisite, Soil Science 105 (22) or equivalent.
Credit, 3. Mr. Waddington.

575 (Soil Science 184). Soil Chemistry (1965-66).
The inorganic and organic chemical reactions related to the nutrient supply in soils and soil nutrition of plants. Colloidal aspects of soil chemical reactions and soil-plant mineral relationships.
Prerequisites, Chemistry 127 (27), and Soil Science 265 (57) or equivalent.
Credit, 3. Mr. Baker.

580 (Agronomy 160). Soil-Plant Mineral Nutrition.
A study of mineral nutrients in the growth of plants; the use of fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities in plants. *Credit, 3.* Mr. Drake.

585. Microbiology of the Soil (1966-67).
Soil microorganisms; their distribution, ecology and transformation of organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium.
Prerequisite, Microbiology 250 (51) or permission of the instructor.
Credit, 3. Mr. Gunner.

PSYCHOLOGY

GRADUATE FACULTY

Head of Department
C. C. Neet

Director of Guidance
J. A. Southworth

Assistant Director of Guidance
B. G. Berenson

Professors
S. Epstein
R. S. Feldman
A. G. Goss
S. L. Kates
W. Teichner

Associate Professor
H. Jarmon

Assistant Professors
R. R. Carkhuff
E. Dzendolet
R. H. Harrison
J. W. Moore
J. L. Myers
L. E. Price

Lecturer
N. A. Myers

Visiting Lecturer
W. B. Simon
A. Trehub

The graduate student majoring in Psychology may orient his program toward either the Doctor of Philosophy degree or the Master of Science degree. Areas of concentration leading to the Ph.D. are: child, clinical, counseling, engineering, learning, physiological, sensory, and social psychology.

Students taking the doctorate must satisfy the general requirements of the Graduate School for the degree. They must also complete the course requirements of their area of specialization. A list of these requirements will be supplied on request to the Department. The doctorate program provides practicum courses in each of the applied specialization areas. Institutions and agencies available for such field work include Belchertown State Hospital, Clarke School for the Deaf, Department of Psychology Child Guidance Clinic, Hartford V. A. Mental Hygiene Clinic, Holyoke Mental Health Clinic, Monson State Hospital, Northampton State Hospital, Northampton V. A. Hospital, Springfield Child Guidance Clinic, Springfield V. A. Mental Hygiene Clinic, University Guidance and Counseling Services, University Nursery School, Worcester V. A. Mental Hygiene Clinic, Worcester Youth Guidance Center, and various industrial concerns in nearby towns.

All students qualifying for the Master of Science degree in Psychology must, in addition to meeting the degree requirements of the Graduate School, take course 545 (175) and either 700 (200) or 800 (300). A final oral examination given by the problem or thesis committee and the Department, is required. Credits taken to satisfy the requirements for the Master's degree can be applied to the total number of credits required for the doctorate.

Students applying for admission for either the Doctor's or Master's degree program, in addition to meeting the requirements of the Graduate School, should have taken an Introductory course and 18 additional undergraduate credits in Psychology, including a course in laboratory experimental psychology, or the equivalent, and a course in statistics. In case the student has not taken this number of credits or lacks these courses, he may be allowed to make up the deficiencies in the Undergraduate School of the University. In exceptional cases, students with entrance deficiencies may, at the end of one semester's study, petition the Department to waive remaining undergraduate deficiencies.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Problem in Psychology.
A research project which may be taken in lieu of the master's thesis, or by doctoral students as minor research. *Credit, 4-6.* The Staff.

711 (211). Sensory Processes I.
Auditory and cutaneous senses; the fundamental data with their implications concerning functioning of these systems.
Prerequisites, Psychology 211 (51) or 6 credits of advanced Psychology and 3 hours of Zoology or the equivalent. *Credit, 3.* Mr. Dzendolet.

712 (212). Sensory Processes II.
Visual, gustatory and olfactory senses; the fundamental data with their implications concerning functioning of these systems.
Prerequisites, Psychology 211 (51) or 711 (211) or 6 credits of advanced Psychology and 3 hours of Zoology or the equivalent.
Credit, 3. Mr. Dzendolet.

715 (208). Perception.
Methods, data, and theory concerning such phenomena as perception of movement, time and frequency, space, form and pattern, and attention.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 711 (211) or 712 (212) or equivalent and Psychology 721 (203) or 723 (204) or equivalent. *Credit, 3.* Mr. Teichner.

716 (223). Advanced Physiological Psychology.
A detailed study of the structure and function of the nervous system as they relate to sensory-motor systems and drives.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 515 (163) or equivalent, or permission of the instructor. *Credit, 3.* Mr. Feldman.

717 (224). Neural Correlates of Behavior.
The neurophysiological bases of behavior. Topics considered are neuroelectric phenomena, psychopharmacology, neurophysiology of learning and drive-reward systems.
Prerequisite, Psychology 515 (163) or equivalent. *Credit, 3.* Mr. Feldman.

721 (203). Learning I.
The basic laws of learning, and relevant research techniques.
Credit, 3. Mr. Moore.

723 (204). Learning II.
The implications of the basic laws of learning for explaining complex behavior.
Prerequisite, Psychology 721 (203). *Credit, 3.* Mr. Moore.

725 (205). Verbal Behavior and Learning.
Methods, situations, and variables involved in assessments of verbal repertoires and in investigations of changes in those repertoires.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 (203) or 723 (204) or equivalent.
Credit, 3. Mr. Goss.

727 (206). Motor Learning and Performance.
Measures of motor learning and performance, pertinent tasks, and conditions influencing learning and performance.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 (203) or 723 (204) or equivalent.
Credit, 3. Mr. Moss.

729 (218). Quantitative Theories of Behavior.
Several theories which generate quantitative predictions of behavior are presented. For each of several experimental situations of varying complexity, mathematical developments of model are discussed and adequacy of description of data evaluated.
Prerequisites, Psychology 545 (175) and 721 (203) or 723 (204) or equivalent. *Credit, 3.* Mr. Myers.

731 (210). Emotion and Motivation.
The nature, determinants, and interrelationships of emotion and motivation; the techniques involved in investigating these phenomena.
Credit, 3. Mr. Trowill.

735 (207). Systematic Psychology.
The general structure of psychological theory and an historical and comparative consideration of the backgrounds, viewpoints on scientific methodology, research interests and techniques, and the component variables, hypotheses, and laws of structural, Gestalt, functional, and behavioristic movements.
Credit, 3. Mr. Goss.

741 (213). Test Construction I.
Theory and practice of the construction and analysis of tests; correlation procedures; reliability; validity; item analysis; test weights; introduction to factor analysis techniques.
Prerequisite, Psychology 545 (175), previously or concurrently.
Credit, 3. Mr. Manley.

742 (214). Test Construction II.
Measurement theory; psychophysical methods; construction, analysis, and comparison of various attitude scales.
Prerequisite, Psychology 741 (213). *Credit, 3.* Mr. Manley.

744 (219). Factor Analysis.
Theory and methods of factor analysis in psychological research.
Prerequisite, Psychology 741 (213) or equivalent. *Credit, 3.* Mr. Manley.

745 (216). Advanced Applied Statistics.
Various experimental designs, the assumptions underlying their use, and the appropriate statistical analyses; orthogonal and randomized designs, trend analysis, non-parametric techniques, and multi-variate analysis.
Prerequisite, Psychology 545 (175) or its equivalent.
Credit, 3. Mr. Myers.

746 (215). Quantitative Methods in Phychology.
Curve fitting, information theory descriptions of data, analyses of curves in terms of harmonic motion, auto- and cross-correlation.
Prerequisite, Psychology 545 (175) or equivalent. *Credit, 3.* Mr. Moore.

762 (242). Learning and Motivation in Children I.
Analysis of experiments on learning and motivation in simple situations with children.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 (203) or 261 (65) or consent of instructor.
Credit, 3. Mr. Price.

763 (243). Learning and Motivation in Children II.
Analysis of experiments on learning and motivation in complex situations with children. Topics include rote learning, transfer and retention, and concept formation.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 (203) or 762 (242) or consent of the instructor.
Credit, 3. Mr. Price.

766 (244). Personality and Social Development in Children.
Review and analysis of the literature on personality development and the socialization process in children.
Prerequisites, Psychology 261 (65), 321 (79) or their equivalent.
Credit, 3. Mr. Schumer.

775 (245). The Psychology of Exceptional Children.
The etiology, diagnosis, and treatment of exceptional children, with special emphasis on intellectual, social, physical and sensory deviations.
Prerequisites, Psychology 312 (82), and 325 (83) or 825 (235) and 261 (65). Students having only two of these three prerequisites may take the course on consent of the instructor. *Credit, 3.* Mr. Jarmon.

777 (246). Diagnosis and Treatment of Behavior Disorders in Children.
The diagnosis and treatment of psychological maladjustments in infancy and childhood; treatment procedures, resources, and methods used in dealing with behavior and personality problems. Lectures, discussions and case demonstrations.
Prerequisites, Psychology 612 (182) and 325 (83) or 825 (235), 261 (65) or 762 (242), 832 (252) and 833 (253). *Credit, 3.* Mr. Jarmon.

781 (221). Attitudes and Social Perception.
Cognitive mechanisms in social behavior; experimental and survey techniques in the study of social perception, attitudes, and attitude change.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 281 (61) or equivalent.
Credit, 3. Mr. Himmelfarb.

784 (222). Group Dynamics.
Interpersonal behavior in small groups, with attention to group structure, individual factors, communication, and experimental techniques.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 286 (62) or equivalent.
Credit, 3. Mr. Himmelfarb.

800 (300). Thesis, Master's Degree. *Credit, 8-10.*

821 (226). Theories of Personality.
Problems and sources of data relating to the study of personality. An evaluation of the contributions of psychological theories, and an approach to an integrated theory.
Prerequisite, Psychology 735 (207). *Credit, 3.* Mr. Harrison.

823 (230). Phychoanalytic Theory.
The original theoretical writings of Freud, other orthodox psychoanalysts and selected neo-Freudians. Emphasis will be placed on the historical development of the key psychoanalytic concepts and on the reasons for their revision.
Prerequisite, one of the following: Psychology 321 (79), 235 (90), 821 (226) or consent of the instructor. *Credit, 3.* Mr. Simon and Mr. Harrison.

825 (235). Advanced Abnormal Psychology.
Behavior disorders and their relationships to normal behavior, with major emphasis on theories of etiology and symptom formation, and on general problems of therapy.
Prerequisite, Psychology 325 (83) or the consent of the instructor.
Credit, 3. Mr. Neet.

830 (250). Fundamentals of Clinical Practice.
The aim of the course is to provide a foundation for advanced courses in clinical psychology. Topics covered include history, professional problems, clinical theories, the clinical method, and fundamentals of diagnosis and treatment of emotional disturbances. *Credit, 3.* Mr. Epstein.

831 (251). Diagnostic Methods I.
The nature, administration, scoring and interpretation of individual intelligence tests with emphasis upon different theories of intelligence.
Prerequisite, 18 credits of psychology or consent of instructor.
Credit, 3. Mr. Goldin.

832 (252). Diagnostic Methods II.
The methods of administration and of the scoring procedures of a variety of diagnostic methods with emphasis on the Rorschach and Thematic Apperception Test.
Prerequisite, Psychology 612 (182).
Credit, 3. Mr. Harmatz and Mr. Simon.

833 (253). Diagnostic Methods III.
Basic interpretive procedures of diagnostic devices with emphasis on the Rorschach and Thematic Apperception Test.
Prerequisite, Psychology 832 (252). *Credit, 3.* Mr. Epstein.

835 (255). Psychotherapy I.
Analyses of techniques of individual psychotherapy. The student may elect concurrently a practicum in psychotherapy in which a therapy case, under supervision, will be carried in one of the following facilities: child guidance clinic, student counseling center, mental hospital.
Prerequisites, Psychology 821 (226), 825 (235), 832 (252) and 833 (253).
Credit, 3. Mr. Kates.

836 (256). Psychotherapy II.
Analyses of group and specialized techniques of psychotherapy. The student will elect concurrently a practicum in which supervised practice in one or more group psychotherapeutic methods will be given.
Prerequisites, Psychology 821 (226), 825 (235), 832 (252), 833 (253) and 835 (255). *Credit, 3.* Mr. Kates.

841 (271). Advanced Industrial Psychology I.
Human factors in work and performance; interrelationships of motivational and perceptual phenomena to the working environment.
Prerequisite, Psychology 651 (186) or permission of instructor.
Credit, 3. Mr. Teichner.

851 (272). Advanced Industrial Psychology.
The theory and principles of man-machine-environment systems, with special attention to description, analysis, and synthesis in terms of information theory, servo analogues, psychophysiological effects, and operations research. Operations research will be considered only as it applies to the context of industrial psychology.
Prerequisites, Psychology 651 (186) and 841 (271).
Credit, 3. Mr. Teichner.

865 (265). Counseling Theories and Techniques.
A detailed consideration of current theories and techniques employed in counseling psychology.
Prerequisites, Psychology 321 (79), 311 (81) and 612 (182) or permission of instructor. *Credit, 3.* Mr. Carkhuff.

871, 872 (283, 284). Practicum.
Practice in the application of psychological techniques to the following areas of psychology: child, clinical, counseling, industrial, and social. Either semester may be elected independently. Total credit, 3-12. The Staff, with the Staffs of cooperating institutions and agencies.

891, 892 (257, 258). Seminar.
Selected topics of current significance in psychology. Research studies will be analyzed and theoretical advances explored. Either semester may be elected independently. Both may be taken only with change in topic.
Prerequisite, permission of instructor.
Credit, 2 each semester. Maximum credit, 6. The Staff.

895, 896 (295, 296). Research Methodology.
A study and evaluation of research methods and of problems in the major fields of psychology. *Credit, 2 each semester.* The Staff.
900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

515 (163). Physiological Psychology.
A study of the relationships between physiological and psychological variables in sensation and perception, motivation, learning, and neuro-pathological conditions.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 101 (1) or 105 (5), Zoology 135 (35) or permission of instructor. *Credit, 3.* Mr. Feldman and Mr. Trowill.

545 (175). Psychological Statistics.
The application of statistical procedures to the analysis of psychological data and to problems of measurement in psychology and related fields.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 101 (1) or 105 (5), Statistics 241 (50) or Statistics.
Credit, 3. Mr. Myers.

551 (172). Advanced Experimental Psychology.
The literature, techniques, and apparatus of experimental psychology. Selected projects carried out individually by the members of the class.
One class hour, two 2-hour laboratory periods.
Prerequisite, Psychology 211 (51) or 221 (52) or 231 (53); Zoology 135 (35). *Credit, 3.* Mr. Dzendolet.

563 (166). Adolescent Psychology.
A consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Price.

581 (161). Social Psychology I.
Development, interrelationships, and functions of attitudes. Emphasis upon religious and political behavior, psychoanalytic and behavioristic theories of prejudice, attitude measurement, propaganda, group persuasion. Survey project.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Himmelfarb.

586 (162). Social Psychology II.
Individual behavior in groups. Interpersonal perception and communication. Norms, power, leadership, and coalition formation. Individual motivation and group problem-solving.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Himmelfarb.

611 (181). Psychological Tests.
Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationale construction, characteristics, uses of evaluation are emphasized.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Schumer.

612 (182). Psychological Tests, Individual Intelligence Tests.
A study of theories of intelligence and of individual intelligence tests.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Goldin.

641 (185). Industrial Psychology I.
Psychological principles underlying personnel selection and training, communication and decision-making in industry.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Moss.

651 (186). Industrial Psychology II.
The application of human factors data to the analysis, evaluation, design and use of man-machine systems and equipment. Emphasis is on analysis of human abilities and limitations of speed, accuracy, perception and decision processes.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Teichner.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Psychology)

511 (151). Sensation and Perception.
A study of the data, theories and the methods of studying sensation and perception.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6), or 101 (1) or 105 (5) and consent of instructor. *Credit, 3.* Mr. Dzendolet.

521 (152). Learning and Thinking.
A consideration of the effects and conditions of practice on acquisition, generalization, discrimination, transfer, retention and extinction phenomena.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6) or 101 (1) or 105 (5) and consent of instructor. *Credit, 3.* Mr. Moore.

531 (153). Motivation.
The data, theories and the methods of investigating motivation. Topics include primary drives, emotions, frustration and conflict, and learned drives.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6) or 101 (1) or 105 (5) and consent of instructor. *Credit, 3.* Mr. Trowill.

535 (190). Contemporary Psychologies.
A logical, historical, and systematic analysis of contemporary psychological theories, including structuralism, functionalism, Gestalt and organistic psychologies, psychoanalysis, and behaviorisms.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Goss.

561 (165). Child Psychology.
The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Price.

575 (167). Introduction to the Study of Exceptional Children.
Emphasis is on the etiology, diagnosis, characteristics, education and prognosis of deviations in mental, physical and socio-emotional development.
Three class hours.
Prerequisite, Psychology 261 (65) or consent of the instructor.
Credit, 3. Mr. Harmatz.

601 (156). Educational Psychology.
Psychological principles and facts fundamental to educational situations. Major areas studies are: learner, learning, adjustment, guidance, teacher, teaching methods, evaluation and measurement.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Schumer.

621 (179). Personality.
An introduction to the scientific study of personality. Topics include psychoanalytic and cognitive approaches, the influence of social-cultural conditions, personality types and learning.
Three class hours.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Kates.

625 (183). Abnormal Psychology.
The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics.
Prerequisite, Psychology 101 (1) or 105 (5). *Credit, 3.* Mr. Neet.

631 (192). Clinical Psychology.
An introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 325 (83) or consent of the instructor.
Credit, 3. Mr. Epstein.

661 (187). Psychology of Occupations.
A study of interests, abilities and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized.
Three class hours.
Prerequisite, Psychology 311 (81). *Credit, 3.* Mr. Field.

665 (188). Theories and Techniques of Counseling and Guidance.
The theories, techniques and tests necessary in counseling and guidance. Practice in organizing and evaluating relevant data in the analysis of illustrative cases.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 311 (81) or consent of the instructor.
Credit, 3. Mr. Carkhuff.

PUBLIC HEALTH

GRADUATE FACULTY

Head of Department
R. W. Gage

Professors
T. H. Feng
W. Litsky
J. S. Peterson, M.D.

Students interested in pursuing investigation or obtaining training in the various areas of public health will be accepted if previous experience indicates an aptitude for graduate study. In general, the course of study will lead to the degree of Master of Science in Public Health. A cooperative program will be arranged with other departments in the event of special interest or need.

Applicants must satisfy the entrance requirements of the Graduate School. Usually they will be best prepared by having completed an undergraduate major

in physical or biological science; they may in special circumstances be accepted with other undergraduate major training. Experience in health services may be accepted in lieu of specific undergraduate requirements.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Public Health.
Special investigational or research problems in public health for advanced students. The scope of the work can be varied to meet specific conditions.
Credit, 3-6. The Staff.

701 (201). Public Health Law.
The uses and limitations of law in disease control. Individual work includes studies of court descisions and the preparation of administrative regulations.
Credit, 3. Mr. Wisnieski.

702 (202). Methods of Public Health Education.
The classical health education efforts that have favorably influenced community health. Individual work involves the preparation of pamphlets and exhibits, setting up demonstrations, and arranging short courses for adult groups.
Credit, 3. Mr. Wisnieski.

703 (203). The Planning of Environmental Health Programs.
Principles of environmental health are translated into community programs planned to meet attainable objectives. Sanitary surveys and rating systems are studied as measuring devices for the practical effect of programs.
Credit, 3. Mr. Wisnieski.

706 (206). Advanced Epidemiology.
Lectures and discussions on the principles and methods of epidemiological investigation, with laboratory work in assembling and analyzing crude data resulting from field investigations of epidemics.
Prerequisite, Public Health 188 or equivalent. *Credit, 3.* The Staff.

390 (207). Seminar.
Lectures and reports on current literature and special topics. (Credits 1-4. Maximum credit, 4.) *Credit, 1-4.* The Staff.

800 (300). Thesis, Master's Degree.
Independent research leading to the preparation of a thesis that will make an original contribution to public health literature. Results should be suitable for publication. The thesis is optional for M.S. candidates who have had sufficient training in public health before entering graduate school to profit more from thesis research than from additional courses. *Credit, 10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

561 (161) (I), 562 (162) (II). Environmental Health.
A study of man's essential environmental needs; water, food, air, shelter; and how these are protected and improved through community action.
Credit, 3. Mr. Wisnieski.

563 (163) (I). Industrial Hygiene and Sanitation.
The practices and principles of industrial processes involved in industrial health and sanitation. Discussion of the fundamentals of industrial sanitation and of occupational diseases and hazards, their evaluation and methods of control. *Credit, 3.* Mr. Perriello.

564 (164) (II). Microscopy of Water.
Microscopic forms of life exclusive of the bacteria. Counting and control of plankton in potable waters. Elements of limnology.
Three class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Perriello.

581 (181) (II). Applied Public Health Bacteriology.
Standard methods used in present day applied bacteriology. Areas of study include: soils, dairy products, water and shellfish, and air.
Two class hours, two 2-hour laboratory periods.
Prerequisite, Microbiology 151 (1) or permission of instructor.
Credit, 3. Mr. Perriello.

584 (184) (II). Public Health Administration.
The organization, function, and administration of governmental health agencies including: public health laws, regulations, and sanitary codes, their origin and enforcement. *Credit, 3.* Mr. Perriello.

586 (186) (II). Public Health Statistics.
Evaluation of environmental health practices using graphical summaries and biostatistical methods.
One class hour, one 4-hour laboratory period.
Prerequisites, Public Health 161 (561) and 162 (562).
Credit, 2. Mr. Wisnieski.

588 (188) (II). Epidemiology and Communicable Disease Control.
The general principles of the spread of infections, supported through the study of the communicable diseases, grouped according to their modes of transmission.
Prerequisite, Microbiology 101 (1) or permission of instructor.
Credit, 3. Mr. Wisnieski.

590 (190) (II). Sanitary Bacteriology.
Sample collections and laboratory procedures in stream pollution studies, standard methods of bacteriological examination of foods, food poisonings and infections.
One 4-hour and one 2-hour laboratory periods.
Prerequisite, Applied Public Health Bacteriology 82 or permission of instructor.
Credit, 3. Mr. Perriello.

592 (194) (Summer). Supervised Field Training.
A thirteen-week field training program with an official agency under the supervision of the Staff. This is a prerequisite for professional placement.
Credit, 3-6. The Staff.

ROMANCE LANGUAGES

Head of Department
R. E. Taylor, *Director, Graduate French Studies*

Professors
S. C. Goding
R. B. Johnson
R. A. Molina, *Director, Graduate Hispanic Studies*
S. S. Weiner

Associate Professors
R. L. Bancroft
S. M. Greenfield
P. Mankin
G. Mermier
I. P. Rothberg

Assistant Professors
P. J. Johnson
A. G. Raymond

Students are required to have oral and written proficiency in the language of specialization before admission to candidacy for the M.A. in French or Spanish.

Course requirements for the M.A.:

1. French 705 (283) (Bibliography and Methods), Spanish 705 (250) (Bibliography and Methods), or an equivalent course.
2. French or Spanish 800 (300) may be elected for not more than nine credits.
3. Terminal examinations as follows:
   a. Comprehensive examination.
   b. For those electing French or Spanish 800 (300), oral defense of thesis.

Students are advised to elect French 710 (201) (Romance Philology and the History of the French Language) or Spanish 710 (201) (Romance Philology and the History of the Spanish Language). These two courses will be taught in English. All other courses offered by the Department are taught in French or in Spanish.

THE FOUR-COLLEGE COOPERATIVE Ph.D. IN FRENCH OR SPANISH

The University of Massachusetts requirements for admission to the Graduate School require "acceptance by the Department." For the Cooperative Ph.D. in French or Spanish, acceptance is by all four departments.

In addition to the general requirements for the degree at the University of Massachusetts, the following special requirements must be met:

1. Required courses:
   a. One semester of Romance Philology, or its equivalent.
   b. One semester of Old French or Old Spanish, or its equivalent.
   c. French 705 (283) (Bibliography and Methods), Spanish 705 (250) (Bibliography and Methods), or the equivalent knowledge.
   d. French or Spanish 900 (400), Ph.D. thesis.
2. A reading knowledge of a second Romance Language and of German or another major language outside the Romance group other than English.

3. The ability to teach French or Spanish.
4. Candidates planning on writing a thesis on the Medieval or Renaissance field must have a reading knowledge of Latin.
5. An oral examination as part of the preliminary comprehensive examination, demonstrating proficiency in the language itself, a knowledge of the whole body of French or Spanish literature and in the history of the language, a thorough knowledge of the candidate's special field, evidence of knowledge of the history and the culture of the country or countries involved.

COURSES OPEN TO GRADUATE STUDENTS ONLY — *FRENCH*

(For major or minor credit)

700 (200). Problem Course.
Directed study in some phase of linguistics or literature.
Credit, 3-6. The Staff.

705 (283). Bibliography and Methods of Literary Research.
(Required of candidates for the degree of Master of Arts in French.)
Credit, 3. Mr. Taylor.

710 (201). Romance Philology and the History of the French Language.
The development of the Romance Languages, particularly French, from Vulgar Latin. *Credit, 3.* Mr. Mermier.

711 (254) French Philology. *Credit, 3.* The Staff.

715 (202). Old French Readings.
Study of the monuments of French literature from the earliest times to the fifteenth century.
Prerequisite, French 710 (201) or the equivalent.
Credit, 3. Mr. Mermier.

720 (215). The Medieval Theater.
Study of the principal dramatic forms from the XIIth century through the XVth. *Credit, 3.*

725 (216). The Old French Epic.
A study of some of the most outstanding *chansons de geste* and of the development of the cycles of epic poetry. *Credit, 3.*

730 (217). The "Roman courtois."
Special emphasis upon Chrétien de Troyes and his successors. *Credit, 3.*

740 (220). Rabelais and Montaigne.
A study of the changing ideas in the French Renaissance. *Credit, 3.*

745 (221). Lyric Poetry of the Renaissance.
Emphasis upon the Pléiade from the background of the "grands rhétoriqueurs," Marot, and the "école lyonnaise." *Credit, 3.*

750 (225). Libertinage in the XVIIth Century.
Aspects of the history of thought from Montaigne to Pierre Bayle.
Credit, 3. Mr. Taylor.

755 (226). La Fontaine and Lyric Poetry.
From Malherbe to the *Fables.* *Credit, 3.*

760 (227). Moliere.
The man and the dramatist; his ideas and his techniques.
Credit, 3. Mr. Taylor.

765 (228). Racine.
A detailed analysis of the major and minor plays as drama and as poetry.
Credit, 3. Mr. Johnson.

770 (230). Voltaire and his Times. *Credit, 3.* Mr. Taylor.

775 (231). Diderot.
The original thinker and the compiler. *Credit, 3.* Mr. Taylor.

780 (232). Montesquieu and his Times.
Credit, 3. Mrs. Raymond or Mr. Taylor.

790, 791 (207, 208). The Craft of Fiction in the Modern French Novel.
The exploration of different modes in the treatment of realism through a study of the craft of fiction of individual novelists, with emphasis upon the novel of the XIXth century. *Credit, 3.* Mr. Smith.

805 (235). Stendhal and Flaubert.
The assimilation of the "mouvement des idées" of the period within the fictional worlds of the two novelists. *Credit, 3.* Mr. Smith.

810 (236). Balzac and Zola. *Credit, 3.* Mr. Smith.

815 (237) Baudelaire and the Symbolists.
Principal emphasis on the aesthetics and poetics of Baudelaire alone, his work serving as an introduction to the gamut of symbolist poetry.
Credit, 3. Mr. Johnson.

820 (238). The Critics of the Nineteenth Century.
The development of criticism from Sainte-Beuve. *Credit, 3.* Mr. Weiner.

825 (240). The Anti-Novel and Anti-Theater.
A study of the reaction against established literary form and convention in the novels of such authors as Sarrauté, Robbe-Grillet, Butor, and Simon, and in the plays of such authors as Ionesco and Adamov.
Credit, 3. Mrs. Johnson.

830 (241). Claudel and Giraudoux.
A study of aesthetic and moral values. *Credit, 3.* Mr. Mankin.

835 (242). Sartre and Camus.
A study of the novels, short stories, plays, and philosophical essays.
Credit, 3. Mrs. Johnson.

840 (243). PROUST AND GIDE. *Credit, 3.*

800 (300). THESIS, MASTER'S DEGREE. *Maximum Credit, 9.*

900 (400). THESIS, PH.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS — *FRENCH*

(For either major or minor credit)

520 (177). THE FRENCH RENAISSANCE.
A study of the major writers of the Sixteenth Century with appropriate attention to important humanistic and artistic developments.
Credit, 3. Mr. Mermier.

525 (155). FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.
Emphasis upon the prose writers and non-dramatic forms.
Credit, 3. Mr. Taylor.

530 (156). FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.
Emphasis upon the theater. *Credit, 3.* Mr. Johnson.

540 (151). FRENCH LITERATURE OF THE EIGHTEENTH CENTURY.
The chief writers and thinkers of the Age of Enlightenment.
Credit, 3. Mr. Taylor.

545 (152). THE DRAMA OF THE FRENCH ENLIGHTENMENT.
Readings in the French theater from LeSage to Beaumarchais.
Credit, 3. Mrs. Raymond.

555, 556 (157, 158). FRENCH LITERATURE OF THE NINETEENTH CENTURY.
Detailed study of the more important authors and movements.
Credit, 3. Mr. Goding.

560 (153). FRENCH THEATRE OF THE TWENTIETH CENTURY.
The modern French Theatre from Scribe to the present. *Credit, 3.* The Staff.

565, 566 (159, 160). MAJOR FIGURES OF THE CONTEMPORARY FRENCH NOVEL.
A study of the novel of social concern, the novel of personal and aesthetic concern, and the novel concerned with the human condition.
Credit, 3 each semester. Mrs. Johnson.

575, 576 (181, 182). CONTEMPORARY FRENCH POETRY.
Study of French verse from Nerval to the present.
Credit, 3 each semester. Mr. Johnson.

600 (175) COURS DE STYLE.
Syntax and idiom at an advanced level. *Credit, 2 each semester.* Mr. Smith.

610 (179). FRENCH CIVILIZATION.
A study of those elements which underlie the cultural contribution of France to world civilization. Assigned reading will be drawn from contemporary French literature. *Credit, 3.* Mr. Mankin.

620 (180). LANGUAGE STUDY.
Teaching methods. Recommended for those intending to teach French in high schools or elementary schools. *Credit, 3.* Mr. Goding.

COURSES OPEN TO GRADUATE STUDENTS ONLY — *SPANISH*

(For major or minor credit)

420 (145). Advanced Conversational Spanish.
Intended primarily for first-year graduate students. Intensive oral practice to insure fluency. Phonetic variants within the Hispanic world.
Two hours per week throughout the year. *Credit, 2.*

700 (200). Problem Course.
Directed study in some phase of linguistics or literature.
Credit, 3-6. The Staff.

705 (250). Bibliography and Methods of Literary Research.
Required of candidates for the degree of Master of Arts in Spanish.
Credit, 3. Mr. Molina.

710 (201). Romance Philology and the History of the Spanish Language.
The development of the Romance Languages, particularly Spanish, from Vulgar Latin. *Credit, 3.* Mr. Molina.

715 (255). Readings in Medieval Spanish.
Prerequisite, A knowledge of Latin, Spanish 710 (201), or the equivalent.
Credit, 3. Mr. Molina.

720 (260). Spanish Literature of the Fourteenth and Fifteenth Centuries.
The literature of Spain in the late Middle Ages, with emphasis on the *Libro de buen amor* and the *Celestina.* *Credit, 3.*

730 (265). The Renaissance in Spain.
A study of Spanish humanism and its effects in the sixteenth century.
Credit, 3. Mr. Rothberg.

735 (268). Gongora and the Baroque Poets.
The culmination of the development of lyric poetry in the Golden Age.
Credit, 3. Mr. Rothberg.

740 (270). Narrative Literature of the Golden Age.
Aspects of novelistic prose in the late sixteenth and seventeenth centuries.
Credit, 3. Mr. Rothberg.

745 272). Lope and Calderon.
The apogee of the theatre of the Golden Age. *Credit, 3.* Mr. Wexler.

755 (275). The Enlightenment in Spain.
Credit, 3.

760 (280). Romanticism in Spain.
Manifestations of the movement peculiar to Spain, with emphasis on Larra and Bécquer. *Credit, 3.* Mr. Greenfield.

165 (281). The Novels of Galdos.
The techniques of the novelist and his panoramic view of Spain.
Credit, 3. Mr. Boudreau.

770 (283) THE GENERATION OF 1898.
A study of interpretive views of "the problem of Spain."
Credit, 3. Mr. Greenfield.

775 (285). THE THEATRE OF GARCIA LORCA.
Detailed analysis of Lorca's Theatre as drama and as poetry.
Credit, 3. Mr. Greenfield.

780 (286) CELA AND THE NOVEL SINCE 1939.
A study of the Novel in post-Civil War Spain, with emphasis on Camilo José Cela. *Credit, 3.* Mr. Boudreau.

785 (290). DARIO AND THE MODERNISTS.
The Modernist movement in Spanish-America with intensive study of the poetry of Rubén Dario. *Credit, 3.* Mr. Greenfield.

790 (291). THE NOVEL OF THE MEXICAN REVOLUTION.
Credit, 3. Miss Haddad.

800 (300). THESIS, MASTER'S DEGREE. *Maximum Credit, 9.*

900 (400). THESIS, PH.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS — *SPANISH*
(For either major or minor credit)

510 (164). ADVANCED SPANISH COMPOSITION AND SYNTAX.
A study of syntax and idioms, and those more advanced and difficult elements which constitute stylistics. *Credit, 3.*

520 (183). PROSE AND POETRY OF THE SIXTEENTH CENTURY.
Masterpieces of Renaissance prose; development of poetry from Garcilaso to Herrera. *Credit, 3.* Mr. Wexler.

530 (184). CERVANTES.
Intensive study of the Quijote. *Credit, 3.* Mr. Wexler.

540 (185). DRAMA OF THE GOLDEN AGE.
Deals primarily with the comedia during the period of maximum creation, 1556-1681. *Credit, 3.* Mr. Wexler.

550 (186). PROSE AND POETRY OF THE SEVENTEENTH CENTURY.
The masterpieces of prose, excluding the Quijote; Gongora and the Baroque poets. *Credit, 3.* Mr. Wexler.

560 (179). SPANISH LITERATURE OF THE NINETEENTH CENTURY.
A study of the major writers and literary movements of the period.
Credit, 3. Mr. Greenfield.

570 (180). SPANISH-AMERICAN LITERATURE TO 1900.
A general view, with intensive study of selected major works.
Credit, 3. Mr. Greenfield.

580 (181). TWENTIETH-CENTURY SPANISH LITERATURE.
Major writers of Spain in the late nineteenth and twentieth centuries.
Credit, 3. Mr. Greenfield.

590 (182). TWENTIETH-CENTURY SPANISH-AMERICAN LITERATURE.
Major writers of Spanish America from Dario to the present.
Credit, 3. Mr. Greenfield.

SOCIOLOGY AND ANTHROPOLOGY

GRADUATE FACULTY

Head of Department
J. H. Korson

Professors
E. D. Driver
M. M. Gordon
W. C. King

Associate Professors
L. Sussmann
T. O. Wilkinson

Assistant Professors
D. H. Fortier
T. M. Fraser
H. H. Golden
B. A. Kay
J. F. Manfredi
J. F. O'Rourke
P. Park
R. Spores
D. W. Yaukey

Visiting Lecturer
G. Mair

Teacher and advisor of graduate students
M. E. W. Goss

All applicants for admission to graduate work in Sociology are expected to be conversant with the basic concepts in the field. With respect to this requirement, an entering student may be asked to remove any deficiencies at the request of the Department.

Students working toward the doctorate in Sociology, in addition to fulfilling the general requirements of the Graduate School for the degree, must include in a program of study the following courses in Sociology: two semesters of sociological theory, two semesters of research methods, and two semesters of statistics. Written comprehensive examinations covering Sociological Theory, Research Methodology, and two areas of substantive interest are required of all students before the doctoral dissertation is undertaken. Upon successful completion of comprehensive examinations, the student will be admitted to candidacy for the Ph.D. degree.

Students working toward the Master of Arts degree in Sociology must satisfy the general requirements of the Graduate School for the degree and must include in a program of study the following courses in Sociology: two semesters of sociological theory, one semester of research methods, and one semester of

statistics. An oral examination by the department covering the student's thesis is required. A special program is available for students who desire to work for a Master's degree in Correctional Administration.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200.) Special Problem.
A special project in Sociology.
Prerequisite, Sociology 795 (195) or equivalent. *Credit, 3.* The Staff.

712 (212). Social Change.
Analysis of change as a process, especially the factors making for acceptance or rejection of innovations. Intrasocietal sources of change. Consequences of contacts between societies, with emphasis on underdeveloped areas.
Prerequisite, Sociology 272 (72) or permission of instructor.
Credit, 3. Mr. King.

714 (214). Criminology.
Criminological theories, past and present with special emphasis on present research trends as they relate to theoretical formulations.
Prerequisite, Sociology 278 (78) or equivalent or permission of instructor.
Credit, 3. Mr. Driver.

716 (216). Correctional Theory and Practice.
An analysis of contemporary approaches to correction. An evaluation of probation, parole, and related problems.
Prerequisites, Sociology 278 (78) and 795 (195). *Credit, 3.* Miss Kay.

717 (217). Juvenile Delinquency.
Theories of causation and treatment of delinquency.
Prerequisite, Sociology 278 (78) or permission of instructor.
Credit, 3. Miss Kay.

718 (218). Industrial Sociology.
A study of the role, status, and function of the worker in the industrial community; the impact of technological change on the community; analysis of selected occupational functions.
Prerequisite, Sociology 254 (68) or Economics 241 (79) or permission of instructor. *Credit, 3.* Mr. Korson.

719 (219). The Sociology of Religion.
The relations of religious ideology and ecclesiastical organization to the total social institutional system. Special attention to the religions of larger civilizations, especially Islam, Buddhism, Medieval Christianity, Gentile Paganism, Protestantism, and Judaism. *Credit, 3.* Mr. Manfredi.

722 (222). Sociology of Education.
Educational characteristics of an industrial population; comparative social structures and their school systems; educational selection and social stratification; educational development as effect and cause of social change; the internal organization and culture of schools and universities.
Prerequisites, one graduate course in sociological theory and one course in research methods. *Credit, 3.* Miss Sussmann.

729 (229). Sociology of Small Groups.
Survey of sociological theory and research of small groups. Dynamics of leadership patterns, role theories, organization-disorganization theories, decision making, internal process and sociometric structuring. The relevance of small group theory and research to concepts of the inclusive social system.
Prerequisite, Sociology 282 (82) or equivalent or permission of instructor.
Credit, 3. Mr. O'Rourke.

731 (231). Social Gerontology.
Implications of aging for society and the individual. Position of the aged in non-industrialized and industrialized societies. Changing roles of older people in the American family and the community.
Prerequisite, Sociology 257 (57) or permission of instructor.
Credit, 3. Mr. King.

732 (232). Sociology of Medicine.
A survey of theory and research concerned with medical care as a social institution. The relation of social factors to illness, and social processes involved in medical education.
Prerequisites, Sociology 282 (82) and 795 (195). *Credit, 3.*

759 (259). Social Stratification.
A consideration of the major contemporary writers and their contribution to this area. Research techniques in the analysis of social class and social mobility are examined.
Prerequisite, Sociology 259 (59) or equivalent or permission of instructor.
Credit, 3. Mr. Gordon.

762 (262). Demography.
An analysis of the demographic transition from peasant-agriculturalism to urban-industrialism. Emphasis is given to the consequences of this transition for patterns of settlement and for fertility, mortality, and migration. Special studies are made of the demographic characteristics of non-industrialized nations as factors in their potential development.
Prerequisite, Sociology 561 (161) or equivalent or permission of instructor.
Credit, 3. Mr. Wilkinson.

763 (263). Fertility and Society.
A review of past and present trends in fertility in Western and non-Western culture. Attention is given to problems of measurement, to interrelations between fertility and other social and economic variables, and to the quantitative and qualitative implications of contemporary research.
Prerequisite, Sociology 561 (161) or equivalent or permission of instructor.
Credit, 3. Mr. Yaukey.

764 (264). Population Characteristics and Socio-Economic Change.
Analysis of relationship between selected demographic characteristics and socio-economic changes, with special attention to the sociological uses of statistical information on the world's countries.
Prerequisite, Sociology 561 (161) or equivalent or permission of instructor.
Credit, 3. Mrs. Golden.

772 (272). Population of India and Pakistan.
Trends in population growth and its distribution among various social strata. An assessment of the relative influence of fertility, mortality, migration, social organization, and cultural values on growth patterns.
Prerequisites, Sociology 561 (161) and 795 (195). *Credit, 3.* Mr. Driver.

781 (281). History of Sociological Theory.
A survey of literature from classical times to the Utilitarians.
Prerequisite, Sociology 282 (82) or permission of instructor.
Credit, 3. Mr. Manfredi

782 (282). Sociological Theory.
The development of sociological theory beginning with Auguste Comte.
Prerequisite, Sociology 282 (82) or permission of instructor.
Credit, 3. Mr. Manfredi.

783 (283). Contemporary Sociological Theory.
A consideration of the literature from 1900 to the present.
Prerequisite, Sociology 282 (82) or permission of instructor.
Credit, 3. Mr. Gordon.

784 (284). Contemporary Sociological Theory.
A consideration of the literature from 1900 to the present.
Prerequisite, Sociology 282 (82) or permission of instructor.
Credit, 3. Mr. Gordon.

795 (195). Research Methods.
Logical analysis of sociological inquiry; survey of major research techniques and examination of principal methodological problems in sociology.
Credit, 3. Mr. Park.

796 (196). Research Methods.
Research techniques in sociology, including: formulating research objectives; collecting, processing and analyzing data for a project organized around the problems of measurement in sociology.
Prerequisites, Sociology 547 (150) and 795 (195). *Credit, 3.* Mr. Park.

797 (297). Survey Design and Analysis.
Design and analysis of descriptive an explanatory sample surveys. Special attention to the problems of longitudinal studies of studies designed to evaluate the effects of a complex experience.
Prerequisite, Sociology 795 (195). *Credit, 3.* Miss Sussmann.

798 (298). Techniques of Data Collection in Social Research.
Study of the validity and reliability for various purposes of a number of observational techniques, including: the interview; the paper and pencil questionnaire; content analysis and participant observation.
Prerequisite, Sociology 795 (195). *Credit, 3.* Miss Sussmann.

799 (299). Internship.
Supervised training and practice in the administration of a state correctional institution or organization. Students chosen for this training will serve with one of the following: Women's Reformatory (Framingham), Men's Reformatory (Concord), The Bureau of Classification (Department of Correction), Youth Service Board (Department of Education), The United Prison Association (Boston) or other agencies approved by the department. A minimum of three months (40-hour weeks) is required and will normally take place the summer following completion of the major part of the student's course work.
Prerequisites, Sociology 592 (192), 714 (214), and 717 (217).
Credit, 3. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 6.*

900 (400). Thesis, Ph.D. Degree. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

547 (150). Elementary Statistics.
Basic statistical principles and techniques with special reference to application in sociology. *Credit, 3.* Mr. Park.

548 (148). Social Statistics.
An introduction to principles of multivariate techniques, including sociology and related fields.
Prerequisite, Sociology 547 (150) or equivalent. *Credit, 3.* Mr. Park.

551 (151). Urban Sociology.
A comparative analysis of cities and urbanization with special reference to demographic characteristics of urban populations, urban ecology, and urban social structure. *Credit, 3.* Mrs. Golden.

552 (152). Rural and Peasant Societies.
A study of rural and peasant societies from the standpoint of their population and institutions, their emerging needs, and their relation to mass society. *Credit, 3.*

556 (156). Race Relations.
The social, economic, and political aspects of racial problems in the U. S., with particular reference to the Negro and major ethnic groups. Problems resulting from contact of races in Asia, Africa, and South America. *Credit, 3.* Mr. Gordon.

557 (157). The Family.
The development of the customs of courtship and marriage of the contemporary American family; basic causes of changes and trends of the family including mate selection, marriage laws, marital prediction husband-wife relations, and the role of the child. *Credit, 3.* Mr. King.

558 (174). Social Interaction.
A study of the processes leading to the socialization of the group member, with emphasis on role properties, play, control models, power definitions and *Credit, 3.*

561 (161). Population Problems.
The physical and social factors which influence population change through births, deaths, and migration, with special emphasis on the population problems of underdeveloped areas in the world today. *Credit, 3.* Mr. Wilkinson.

570 (170). Social Structure of India.
The origins, distribution, and cultural traits of the major groups in India. Special attention given to marriage, family, and caste patterns, and their relation to and positions in the economic and political system. *Credit, 3.* Mr. Driver.

575 (175). Social Problems.
The incidence, distribution, and interrelations among the major types of social tensions in human societies. Research projects and field trips required. *Credit, 3.* Mr. Stanfield.

592 (192). Introduction to Social Welfare.
Contemporary problems of social welfare administration, principles of social work practice, and an examination of federal, state, and local community programs. *Credit, 3.* Miss Kay.

Anthropology

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

836 (236). Individual and Society.
A cross-cultural consideration of the relationship between the individual and his society with attention to theories, methods and empirical findings as reported in the literature of the behavioral sciences.
Prerequisite, Anthropology 664 (164) or permission of instructor.
Credit, 3. Mr. Stanfield.

837 (237). Theory in Social Anthropology.
Theoretical problems which have had a lasting place in anthropological thought; the nature of culture, cultural dynamics and stability, and the transmission of culture as discussed by leading writers.
Prerequisite, Anthropology 664 (164) or permission of instructor.
Credit, 3. Mr. Fortier.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For major or minor credit)

660 (160). World Archaeology.
An introduction to the history, methods and theory of archaeology, with an outline of the main characteristics of the prehistoric record, emphasizing social aspects and evolutionary significance.
Two class hours, one 2-hour laboratory period.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Spores.

664 (164). Problems in Anthropology.
A consideration in detail of current anthropological thought in regard to specific problems chosen from physical anthropology, archaeology and cultural anthropology.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

665 (165). World Ethnography.
The current cultures of representative societies from Africa, Oceania, North America, South America, and Asia viewed in relation to historical and environmental influences.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

667 (167). Ethnology of Africa.
A limited consideration of the history, physical types, social organization and culture of Africa south of the Sahara with special consideration of several diverse cultures.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Spores.

673 (173). PEOPLES OF SOUTHEAST ASIA.
An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role in the development of modern Southeast Asian states.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

674 (174). CULTURES OF THE FAR EAST.
A survey of the culture-history and ethnography of representative peoples of East Asia; peasant sub-cultures of traditional and contemporary China, Japan, and Korea.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fortier.

676 (176). THE ETHNOLOGY OF SOUTH AMERICA.
This course will analyse the prehistoric, colonial and contemporary cultures of South America, focusing on the Indian, European and Negro peoples, and how they have related to each other over the past three centuries.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Spores.

679 (179). CULTURAL DYNAMICS AND APPLIED ANTHROPOLOGY.
A consideration of theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

550 (160). SOCIAL SCIENCE — AFRICA, SOUTH OF THE SAHARA.
An introductory study of recent political, economic, and social developments in the principal countries in Africa, south of the Sahara.
Prerequisites, at least two courses in one or more of the following fields: Government, Economics, Sociology. *Credit, 3.*

569 (169). SOCIAL SCIENCE — INDIA AND SOUTH ASIA.
An introductory study of recent political, economic, and social developments in India and the countries of South Asia.
Prerequisites, at least two semester courses in one or more of the following fields: Government, Economics, Sociology, Anthropology.
Credit, 3. Mr. Driver.

SPEECH

GRADUATE FACULTY
Head of Department
A. E. Niedeck
Associate Professor
I. E. Hegarty
Assistant Professors
D. E. Abramson
C. A. Catalano
H. Mahnken

The Department of Speech offers two major programs for the Master's degree. The M.F.A. may be earned in dramatic art and the M.A. in speech and hearing.

Options leading toward the Master of Arts degree are available in speech pathology, audiology and teacher of the deaf preparation. The latter is presented in cooperation with the Clarke School for the Deaf, Northampton, Massachusetts. Federal grants are available for qualified students in the program.

Students may fulfill certification requirements of the American Speech and Hearing Association, Conference of the Executives of Schools for the Deaf, and the Massachusetts State Department of Education in these areas.

1. General Admission Requirements:
   a. Basic requirement for admission to the Graduate School.
   b. Students presenting at least twelve hours of Speech (i.e.), Speech 281 (81), 284 (83), 283 (82), 282 (85) or their equivalents and nine hours in Psychology or Education may be accepted as regular graduate students in Speech.
   c. Students presenting at least three hours in Speech (i.e.), Speech 281 (81), 282 (85), or 283 (82) and a major in Psychology or Education are eligible for admission as special graduate students in Speech.
2. Basic Requirements:
   a. Thirty hours of graduate courses, including twenty-four hours in the major field. Psychology or Education may be chosen as the minor field.
   b. A thesis will be required.
   c. There will be no foreign language required.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

781 (201). Voice Problems.
A study of voice disorders, organic and functional; symptoms and principles and techniques of therapy and diagnosis.
Prerequisites, Speech 284 (83) and 282 (85) or equivalents.
Credit, 3. Miss Hegarty.

782 (200). Clinical Practicum.
Supervised clinical practice with children and adults with various speech and hearing disorders; group and individual therapy techniques.
Prerequisites, Speech 281 (81), 284 (83), 282 (85) or equivalents.
Credit, 3-6 each semester. The Staff.

783 (203). Experimental Phonetics.
Study and analysis of phonetic elements of language, emphasis on laboratory instrumentation and research techniques.
Prerequisites, Speech 281 (81) and 284 (83) or equivalents.
Credit, 3. The Staff.

800 (300). Master's Thesis. *Credit, 3-6.* Miss Hegarty.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

501 (151). Public Speaking.
The study and application of principles governing the composition and delivery of public speeches.
Three class hours. *Credit, 3.* The Staff.

581 (181). Phonetics.
A scientific study of the sounds of English; descriptive analysis of individual vowels and consonants. Study of the International Phonetic Alphabet; training in auditory discrimination.
Three class hours. *Credit, 3.* Miss Hanifan and Miss Labelle.

582 (185). Introduction to Speech Pathology.
A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy.
Observation; field trips.
Three class hours.
Prerequisite, Psychology 101 (1). *Credit, 3.* Miss Hegarty.

583 (182). Introduction to Clinical Practice.
Training in basic diagnostic and therapeutic techniques for various speech handicaps; emphasis on articulation defects, delayed speech and stuttering, supervised practice required.
Two class hours, one 2-hour laboratory period.
Prerequisites, Speech 281 (81) and 282 (85).
Credit, 3. Miss Hanifan and Miss Labelle.

584 (183). Anatomy and Physiology of the Speech and Hearing Mechanism.
A study of the anatomy and physiology of the speech and hearing mechanism; consideration of phonation, resonance, articulation and audition.
Three class hours.
Prerequisite, Speech 282 (85). *Credit, 3.* Miss Hegarty.

585 (184). Audiology.
A study of the symptoms and causes of hearing loss; special attention to diagnostic test procedures. Supervised practice in audiometric testing.
Observation; field trips.
Three class hours.
Prerequisite, Speech 282 (85). *Credit, 3.* The Staff.

586 (186). Rehabilitation of the Acoustically Handicapped.
Training in the techniques of speech therapy, auditory training, and speech reading for children and adults with hearing impairments.
Laboratory practice under supervision.
Two class hours, one 2-hour laboratory period.
Prerequisite, Speech 585 (84). *Credit, 3.* The Staff.

588 (188). Advanced Clinical Practice.
Advanced training in clinical practice under supervision; special consideration of organic speech disorders. Opportunity for supervised clinical practice at Lemuel Shattuck and other hospitals.
Two class hours, one 2-hour laboratory period.
Prerequisite, Speech 283 (82). *Credit, 3.* Miss Hegarty.

589 (196). Seminar in Speech Pathology.
Individual student reports on selected topics in the field of Speech Pathology.
Three class hours.
Prerequisite, Speech 282 (85). *Credit, 3.* Miss Hegarty.

Options leading toward the MASTER OF FINE ARTS degree are available in acting, directing and scene design.

All candidates for the M.F.A. degree with a major in Dramatic Art must demonstrate a theatre proficiency which in the opinion of the dramatic art faculty is commensurate with their particular level of education and development. Other requirements for the degree are listed on Page 24.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems. *Credit, up to 18.*

742 (242). Historic Costume for the Stage.
A study of the historic periods of costume design and the adaptation of costume for use on the stage. Some emphasis will be placed upon silouette, color, texture and social significance of the historical costume.
Credit. 3. The Staff.

744 (244). Styles of Acting.
A study of the various presentational and pre-modern styles of acting. Emphasis will be placed upon the Classical, Elizabethan, Restoration, and Musical Comedy styles.
Prerequisite, permission of the instructor. *Credit, 3.* The Staff.

749 (249). Dramatic Form and Structure.
A study of the theoretical foundations of dramatic form as reflected by the writings of dramaturgists and critics from the beginnings of theatre to the present day.
Prerequisite, permission of the instructor. *Credit, 3.* The Staff.

758 (258). Rehearsal and Performance.
Practical experience and application of learned classroom theory to all phases of theatre production. Candidate may receive up to eight hours credit toward the degree. *Credit, 2.* The Staff.

759 (259). Seminar in Theatre.
Advanced study and practice in the complex problems of the modern theatre. Emphasis will be placed upon the study of Acting, Directing, Scenic and Costume Design and the problems in coordinating the engineering and mechanical aspects of production and lighting in the modern theatre.
Prerequisite, Permission. This course may be repeated for up to 12 hrs.
Credit, 3. The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

541 (171). Introduction to Scene Design.
The study of the aesthetics, fundamentals and facets of scene design through lectures, class projects and practical laboratory work.
Prerequisites, Speech 40 and 41, or permission of instructor.
Credit, 3. The Staff.

546 (176). Fundamental Theories of Play Directing.
The study of the principal theories of play direction with emphasis on the Director as an interpretative artist; a study of the audience and the play in terms of the nature of the dramatic and the theatrical.
Prerequisites, Speech 75, or permission of instructor.
Credit, 3. Mr. Mahnken.

547 (177). History of Theatre of Western Civilization I.
The study of the History of the Theatre of Western Civilization from its beginnings to 1642; an investigation of the Classical, Medieval and Renaissance Theatres with emphasis on the origins and development of Drama, Spectacle, Theatre Production and Theatre Architecture. *Credit, 3.* The Staff.

548 (178). History of Theatre of Western Civilization II.
A continuation of Speech 177 with emphasis on the 18th and 19th centuries, the Continental, English, American, and Modern Theatre.
Credit, 3. The Staff.

550 (150). Voice and Diction and Oral Interpretation.
Training and drill in correct production of speech, practice in fundamentals of vocal interpretation. *Credit, 3.* Miss Abramson.

574 (174). Fundamental Theories of Acting.
The study of the principal theories of acting; the investigation and application of the principal historical and contemporary theories of character analysis, development and performance.
Prerequisite, Speech 73, or permission of the instructor.
Credit, 3. Mr. Catalano.

STATISTICS

GRADUATE FACULTY

Head of Department
G. B. Oakland

Professors
R. K. Damon, Jr.
J. Myers
R. W. Wagner
(Associate Dean of College of Arts and Sciences)

Assistant Professor
J. Norman, Jr.

Students taking the master of arts in statistics must meet the degree requirements of the Graduate School. Although desirable, previous work in statistics

is not essential for graduate study in statistics. A sound background of supporting mathematics is of greater importance. Thus majors in statistics will receive their statistical training as graduate students. Their undergraduate work will consist largely of mathematics and other related fields.

List of Courses

Statistics 551 (151), Elementary Statistics

Statistics 555, 556 (155, 156), Introductory Statistics

Statistics 561 (161), The Design of Experiments (Methods)

Statistics 662 (162), The Design of Experiments (Theory)

Statistics 571 (171), Sample Surveys

Statistics 572 (172), Sample Theory and Methods

Statistics 581 (181), Multivariate Analysis (Methods)

Statistics 682 (182), Multivariate Analysis (Theory)

Statistics 692 (192), Frequency Distributions

*Statistics 701, 702 (201, 202), Statistical Tests and Decision Procedures

*Statistics 725, 726 (225, 226), Estimation Theory and Hypothesis Testing

Statistics 841, 842 (241, 242), Recent Developments in Statistics

*Statistics 880 (280), Seminar

*Offered 1965-66

Statistics 551 (151), 555 (155), and 556 (156) are for minor credit only.

Statistics 561 (161), 662 (162), 571 (171), 572 (172), 581 (181), 682 (182), 692 (192), are for major credit as are the courses in the 700 and 800 series.

The candidate will consult with a member of the Statistics Faculty in preparing a program of study. A total of 30 graduate credit hours is required; of which not more than 6 credit hours may be taken in other departments. On approval, courses of a mathematical nature can be substituted for an additional 6 credit hours of statistics. The following courses would be required for a Master's degree in statistics: twelve credit hours from 561 (161), 662 (162), 571 (171), 572 (172), 581 (181), 682 (182), 692 (192) and twelve credit hours from 701 (201), 702 (202), 726 (226), 841 (241), 842 (242). A sample program could consist of 21 graduate hours from courses 662 (162), 572 (172), 682 (182), 701 (201), 702 (202), 841 (241), 842 (242), and 880 (280), and the remaining 6 credit hours from other departments with an additional three credit hours of a course of a mathematical nature.

Students specializing in statistics are advised to have a sound minor in a field of application. This minor can be chosen from courses equivalent to those required for undergraduate majors. Cognate courses are needed to supply a basis for mature thinking. Students should choose cognate courses

from such fields as genetics, animal and plant breeding, sociology, psychology, engineering, econometics, and market research, etc. Statistics leans very heavily on mathematics, and most of the prerequisites and corequisites will come from such mathematical courses as: probability, numerical analysis, introductory modern analysis, and differential equations.

The statistical specialist must have a knowledge of modern computing methods, their capabilities and limitations. Familiarity with computers is essential for advanced work in statistics. Students are required to program a problem and obtain its solution on a computer.

The candidate is expected to obtain experience in statistical applications. A minor role in consulting work or an internship in an organization where statistics can be applied provides experience in this direction.

COURSES OPEN TO GRADUATE STUDENTS ONLY

*701, 702 (201, 202). Statistical Test and Decision Procedures.
Power of a test, O. C. Curves, Parametric tests; F, Hotelling's T, Multiple comparisons, Bartlett's Non-parametric tests: Chi-square, Kolmogorov-Smirnov, order statistics, ranking.
Prerequisites or corequisite, Statistics 662 (162) and 572 (172).
Credit, 3 each semester.

*725, 726 (225, 226). Estimation Theory and Hypothesis Testing.
Maximum likelihood, types of estimators, properties of estimators, 2 sample problem, k sample problem.
Prerequisites or corequisites, Statistics 662 (162), 572 (172), and 682 (182).
Credit, 3 each semester.

841, 842 (241, 242). Recent Developments in Statistics.
The course material is selected from such modern areas of statistical thought as: stochastic processes, counting, gaussian and stationary processes, spectral distribution functions, birth and death processes, monte carlo, Box's optimizing processes.
Prerequisite, consent of instructor. *Credit, 3 each semester.*

*880 (280). Seminar.
Research papers by staff and students; invited lectures by prominent statisticians. *Credit, 1, 2, or 3.*
*Offered 1965-66

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

561 (161). Design of Experiments (Methods).
Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields.
Prerequisite, Statistics 551 (151), or 556 (156). *Credit, 3.*

562 (162). Design of Experiments (Theory).
Conceptual basis of experimental designs, especially randomized blocks, latin squares, factorial and sequential, incomplete blocks, and experiments with attributes.
Prerequisite, Statistics 556 (156). *Credit, 3.*

571 (171). Survey Sampling.
The theory and practice of sampling, optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, the problem of non-response.
Prerquisite, Statistics 551 (151) or 556 (156). *Credit, 3.*

572 (172). Sampling Theory and Methods.
Problems and methods of sampling, production and quality control, acceptance sampling OC and ASN curves, types and properties of estimators.
Prerequisite, Statistics 551 (151) or 556 (156). *Credit, 3.*

581 (181). Multivariate Analysis (Methods).
Applications of the theory in Statistics 682 to actual problems; it may involve research studies by the students, critiques of published research, or analysis of other bodies of data.
Prerequisite, Statistics 551 (151) or 556 (156). *Credit, 3.*

682 (182). Multivariate Analysis (Theory).
Correlations and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions.
Prerequisite, Statistics 556 (156). *Credit, 3.*

692 (192). Frequency Distributions.
Basic probability, frequency functions, transformation of variates, generating functions, normal and related distributions, binomial, multinomial, hypergeometric, Poisson, exponential, logarithmic and other distributions including Pearson's system.
Prerequisites, Statistics 556 (156) and Mathematics 241 (92) (or concurrently). *Credit, 3.*

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Statistics)

551 (151). Elementary Statistics.
The analysis of variance, the design of experiments, simple surveys, multiple regression, non-parametric tests.
Prerequisite, Statistics 121 (21). *Credit, 3.*

555, 556 (155, 156). Introductory Statistics.
Parallel courses to Statistics 121 (21) and 551 (151) but with calculus prerequisite.
Corequisite, Mathematics 174 (26) or 185 (31). *Credit, 3.*

VETERINARY SCIENCE

COURSES FOR MINOR CREDIT ONLY

172. General Veterinary Pathology. *Credit, 3.* Mr. Smith.

WILDLIFE AND FISHERIES BIOLOGY

GRADUATE FACULTY

Head of Department
A. W. Rhodes

Professor
W. G. Sheldon

Associate Professors
F. Greeley (major advisor)
C. F. Cole (major advisor)
D. K. Wetherbee

Assistant Professor
B. C. Wentworth

Most applicants for admission to graduate work in wildlife and fisheries biology must have completed a Bachelor's degree in the biological sciences. Occasional exceptions are made for applicants from other fields, provided they make up their deficiencies in basic biology as part of their graduate program.

Graduate students pursue courses of study directed toward acquiring proficiency in independent research in either wildlife or fisheries field. Work in fisheries involves both fresh water and marine environments. Courses may be taken in the department and in related fields. A research thesis is normally required. Graduate students may conduct research under the supervision of the Cooperative Wildlife and Fishery Units and are eligible for support from the Units provided by the Massachusetts Division of Fisheries and Game, the Massachusetts Division of Marine Fisheries, and the United States Bureau of Sport Fisheries and Wildlife.

Undergraduate students who receive their Bachelor's degree in fisheries or wildlife at the University of Massachusetts are urged to pursue graduate work at other universities, many of which also have Cooperative Research Units.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems in Wildlife or Fisheries Biology.
Credit, 3 per semester. Maximum credit, 6. The Staff.

701, 702 (201, 202). Seminar in Wildlife and Fisheries Biology.
Review and discussion of the literature in Wildlife and Fisheries Biology, including such subjects as population dynamics and manipulation, law and administration, Afro-Eurasian problems, influence of land-use, Arctic environments and others.
Credit, 3 per semester. Maximum credit, 6. The Staff.

800 (300). Thesis, Master's Degree. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

561 (161). Principles of Wildlife Biology.
Fundamental ecology and principles of Wildlife Management, with emphasis on population characteristics and responses. *Credit, 3.* Mr. Greeley.

562 (162). Techniques of Wildlife Biology.
Methods of collecting and interpreting data in Wildlife Management, with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals.
Credit, 3. Mr. Greeley.

563 (163). Management of Wetland Wildlife.
Life histories, identification and habitat requirements of waterfowl and marshland furbearing animals; management of wetland habitats. 1966-67 and each alternate year.
Credit, 3. Mr. Greeley.

564 (164). Management of Upland Wildlife.
Life histories, identification and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats.
1965-66 and each alternate year.
Credit, 3. Mr. Greeley.

565 (165). Techniques of Fisheries Biology.
Principles and techniques of fishery management, stressing population and growth dynamics, and field procedures. *Credit, 3.* Mr. Cole.

566 (166). Physiology of Fishes.
Study of physiological functions relative to the environment of fishes. The adaptations of local species to particular habitats will be studied in the field and laboratory.
1965-66 and each alternate year. *Credit, 3.* Mr. Cole.

568 (168). Survey of Fisheries Resources.
Review of the sport and commercial fisheries of the United States, with special emphasis on crustaceans, molluscs and fishes. Coastal field trips by arrangement. *Credit, 3.* Mr. Cole.

COURSES IN OTHER DEPARTMENT FOR WHICH MAJOR CREDIT MAY BE GIVEN

When appropriate for the student's program of instruction and research, and with the consent of the student's advisor, major credit will be given for certain courses in the following subject-matter areas: Agricultural and Food Economics, Botany, Education, Entomology and Plant Pathology, Forestry, Statistics, and Zoology.

ZOOLOGY

GRADUATE FACULTY

Head of Department
D. Fairbairn

Professors
E. Anderson
L. M. Bartlett
B. M. Honigberg
W. B. Nutting
H. Rauch
J. G. Snedecor

ZOOLOGY

Associate Professors
W. R. Harvey
J. G. Moner
J. L. Roberts
H. D. Rollason
P. A. Swenson

Assistant Professors
A. P. Mange
L. S. Roberts
T. D. Sargent
D. P. Snyder

Facilities are provided for students intending to complete the requirements for the Degree, Master of Science, or Doctor of Philosophy. A minimum of 20 credits of biology is required for admission to graduate standing; applicants who cannot satisfy this requirement may be admitted as special students. Candidates for the Master's degree must satisfy Department and Graduate School foreign language requirements in one of German, French or Russian. Any two of these languages are required of doctoral candidates.

The degree, Master of Science, is awarded to students who satisfactorily meet the requirements of the Graduate School and who present a thesis or a minimum of six and a maximum of nine credits in Zoology 700 (200). An oral examination is required of all candidates.

Each candidate for the degree, Doctor of Philosophy, follows a course of study acceptable to him and to his guidance committee. Before a thesis is submitted he must demonstrate general competence by means of written, followed by oral, examinations.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700 (200). Special Problems. *Credit, 1-9.* The Staff.

702 (273) (II). General Cytology.
The morphological features of cells in relation to their function. Lectures, seminar reports and individual laboratory work.
Prerequisite, Zoology 523 (150) *Credit, 3.* Mr. Rollason.

708 (210) (I). Electron Microscopy.
Lectures and laboratory on the electron microscope and methods of specimen preparation.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Anderson.

710 (275) (II). Fine Structure and Function of Cells.
Lectures, discussions, readings and reports on fine structure of cells and dynamic morphology.
Prerequisites, Zoology 523 (150), 660 (183). *Credit, 3.* Mr. Anderson.

720 (220) (II). Experimental Embryology.
Physiology, biochemistry, and ultrastructure of development with reference to gametogenesis, fertilization, cleavage, induction, differentiation, regeneration, and metamorphosis. Emphasis on control mechanisms.
Prerequisites, Zoology 525 (172), Chemistry 160 (33).
Credit, 3. Mr. Harvey.

730 (248) (II). Physiological Genetics.
The nature of the gene and its action in the developmental and physiological processes of the organism.
Prerequisites, Zoology 540 (153) and permission of instructor.
Credit, 3. Mr. Rauch

740 (202) (I). Advanced Invertebrate Zoology.
Morphology, habits and life cycles of aquatic invertebrates. Laboratory, discussion periods, field trips.
Prerequisite, Zoology 571 (170). *Credit, 3.* Mr. Nutting.

744 (204) (II). Helminthology.
Host-parasite relationships, systematics, morphology, and life histories of metazoan animal parasites with emphasis on helminths.
Laboratory on research techniques.
Prerequisites, Zoology 583 (169), 571 (170) and permission of instructor.
Credit, 3. Mr. L. S. Roberts.

750 (265) (I). Animal Behavior.
A consideration of the biological bases of animal behavior, with an analysis of the methods and objectives of current research.
Two 2-hour lecture-discussion periods.
Prerequisites, Vertebrate and invertebrate zoology, or physiological psychology and permission of instructor. *Credit, 3.* Mr. Sargent.

780 (240) (II). Advanced Cellular and Comparative Physiology.
Detailed study of one or more of the following topics: physiology of the cell growth cycle, radiation biology and regulatory mechanisms in cells and higher animals.
Prerequisites, Zoology 660 (183) and 670 (184).
Credit, 2-4. Mr. Swenson, J. L. Roberts and Mr. Moner.

784 (287) (I). Endocrinology.
The importance of the endocrines in their control over normal functions (growth, metabolism, reproduction, etc.) in a variety of animals.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 666 (185). *Credit, 3.* Mr. Snedecor.

800 (300). Thesis, Master's Degree. *Credit, 10.*

850 (255) (I) (II). Seminar. *Credit, 1.* The Staff.

900 (400). Thesis, Ph.D. Degree.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

521 (171) (I) (II). Comparative Vertebrate Anatomy.
Structure and phylogeny of the vertebrates. Laboratory work will illustrate evolutionary trends and specializations and provide experience in dissection.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101 (1). *Credit, 3.* Mr. Snyder, Mr. Klingener.

523 (150) (I). Histology.
The structure of cells, tissues and organs as related to function, with emphasis on the mammal; introduction to microtechnique.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101 (1). *Credit, 3.* Mr. Rollason.

525 (172) (II). Embryology.
Lectures emphasize physiological and biochemical aspects of development. Laboratories deal with descriptive and comparative phases of ontogeny, especially of amphibian, bird, and mammal.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 521 (171). *Credit, 3.* Mr. Harvey

540 (153) (I). Principles of Genetics.
Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics and evolution.
Three class hours.
Prerequisites, Zoology 101 (1), Chemistry 112 (2) or 114 (4).
Credit, 3. Mr. Rauch.

542 (152) (II). Genetics Laboratory.
Laboratory experiments illustrating transmission genetics, including linkage and gene location.
One 3-hour laboratory period.
Prerequisite, Zoology 540 (153). *Credit, 1.* Mr. Rauch.

546 (178) (I). Population Genetics.
Introduction to the principles of population genetics; the population approach to the origin of species and the study of human genetics.
Three class hours.
Prerequisites, Zoology 540 (153) and permission of instructor.
Credit, 3. Mr. Mange.

571 (170) (II). Invertebrate Zoology.
A survey of invertebrate animals based upon evolutionary and phylogenetic considerations.
Lectures, discussion periods, laboratory.
Prerequisite, Zoology 521 (171) or permission of instructor.
Credit, 3. Mr. Nutting.

575 (164) (II). Biology of Protozoa (1966-67).
Morphology and physiology of Protozoa, with emphasis on the contributions made on the basic problems of biology through the study of these organisms.
One class hour, one 2-hour and one 3-hour laboratory periods.
Prerequisites, Zoology 101 (1) and permission of instructor.
Credit, 3. Mr. Honigberg.

583 (169) (I). General Parasitology.
Morphology, life cycles, and physiology of protozoan and helminth parasites, with emphasis on broad aspects of parasitism.
Two class hours, two 2-hour laboratory periods.
Prerequisites, Zoology 101 (1), Chemistry 112 (2) or 114 (4).
Credit, 4. Mr. Honigberg.

600 (181) (I). Vertebrate Zoology.
History, relationships, patterns of distribution, classification, and ecology, with major emphasis on the fishes.
One class hour, two 2-hour laboratory periods, field trips.
Prerequisite, Zoology 101 (1). *Credit, 3.* Mr. Andrews.

602 (186) (II). Ichthyology.
The morphology, ecology and relationships of fishes, and their distribution in space and time.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 521 (171) or 600 (181), or permission of instructor.
Credit, 3. Mr. Andrews.

606 (180) (II). Ornithology.
Avian biology with emphasis on structural and functional adaptations, and particularly behavioral patterns. Laboratory includes field trips.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101 (1). *Credit, 3.* Mr. Bartlett.

608 (182) (II). Mammalogy.
Evolution, distribution, classification and ecology of mammals. Laboratory includes field trips, preparation of study material, and identification of local fauna.
Two class hours, one 3-hour laboratory period.
Prerequisites, Zoology 521 (171) or 600 (181) and permission of instructor.
Credit, 3. Mr. Snyder.

635 (174) (II). Limnology (1965-66).
Study of inland waters, including geological, physical, chemical and biological aspects.
Two class hours, two 3-hour laboratories or field trips.
Prerequisites, Botany 100 (1), Zoology 101 (1), Chemistry 112 (2), and permission of instructor. *Credit, 4.* Mr. Andrews.
in cooperation with the departments of Botany, Entomology, Public Health, Geology, and Zoology.

660 (183) (I). General and Cellular Physiology.
Modern trends in physiology with emphasis on the chemical and physical properties of cells, including protoplasmic organization, cellular metabolism, permeability, bioelectric phenomena, muscle contraction, radiation biology, and cellular regulatory mechanisms.
Three class hours, one 3-hour laboratory period.
Prerequisites, one year biology and organic chemistry.
Credit, 4. Mr. Swenson, Mr. Moner.

666 (185) (II). Vertebrate Physiology.
Function of organs and organ systems in vertebrates.
Three class hours, one 3-hour laboratory period.
Prerequisite, Zoology 660 (183) or Chemistry 520 (179) or 524 (194).
Credit, 4. Mr. Snedecor.

670 (184) (I). Comparative Physiology.
Physiological principles involved in adaptations of animals to their environment; emphasis in the laboratory on experimental methods used to study adaptive mechanisms.
Three class hours, one 3-hour laboratory period.
Prerequisite, Zoology 660 (183). *Credit, 4.* Mr. J. L. Roberts.

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1963-1964

REPORT OF THE PRESIDENT

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BULLETIN

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TO THE BOARD OF TRUSTEES

I am pleased to present this Report for the academic year 1963-1964. In many important ways, this has been a momentous period in the history of the University and indeed of education on all levels in the Commonwealth of Massachusetts. What is recorded in this Report is, therefore, a reflection of the will of the people of Massachusetts to support a comprehensive design for the education of the Commonwealth's citizens. Much has already been done, but the greatest part of the effort lies ahead; and we at the University of Massachusetts look forward to joining with all of our institutions of public education in making this effort impressively successful.

John W. Lederle
President

December 31, 1964

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REPORT OF THE PRESIDENT

NEW DESIGN FOR MASSACHUSETTS

I begin this Report with the recollection that, in 1954, only ten years ago, a leading commentator on American society wrote that, at that time, one of the major deficiencies in our way of life was the kind of support given to the cause of education at all levels.

In an essay in *The Atlantic Monthly* (May, 1954), Walter Lippmann pointed out that "it is the deficit in our educational effort which compels us to deny the children fitted for leadership of the nation the opportunity to become educated for that task." Indeed, the main argument about education, according to Mr. Lippmann, revolved around a needless dispute about alternatives — "of whether to address the effort in education to the average of ability or to the higher capacities . . . " But why, Mr. Lippmann asked, do we have to choose? "Why are we not planning to educate everybody as much as everybody can be educated . . . ?"

For Mr. Lippmann as for many other far-sighted Americans, our obligation is crystal clear: "We have come to the point where we must lift ourselves as promptly as we can to a new and much higher level of interest, of attention, of hard work, . . . of expenditure, and of dedication to the education of the American people."

With these words in mind, I wish to begin this Report covering a period occurring just a decade after the foregoing statements were published. I do this because I firmly believe that the citizens of the Commonwealth of Massachusetts in the past year have taken an historic turn in their approach to education by responding forcefully and effectively to the call for action as expressed by those who have the gift of insight into what the future will really demand.

The history of Massachusetts education in the period 1963–64 has been such as to encourage all of our citizenry that there may be a high new road soon to be traveled by all who seek knowledge and its benefits. At present, of course, that road does not exist — which is another way of saying that we have not begun dealing with the hard problems, the persistent deficiencies. These have in fact multiplied and taken on a complexity that even the most prophetic among us could not have anticipated in 1954. The most encouraging development in the recent past has therefore been the important fact that within a very brief period of time the Commonwealth has made an assessment which has raised the whole question of education to the top of the priority list of major public concerns. And this means that appropriate resources are being provided to identify and to analyze the problems in education with the clear purpose of improving the whole broad front of educational effort in the Commonwealth.

What is being done is actually the beginning of a grand design for the lifting of educational activity, on all levels, to "a new and much higher level" in a state that has been noted for excellence in this field from the time the first schoolhouse was opened in the primitive surroundings of the Massachusetts Bay Colony.

The University of Massachusetts, as the chief facility of public higher education, is wholly committed to making a major contribution to the shaping of this design, for certainly without such a commitment on the university level, no plan for general and comprehensive improvement can succeed. Thus, as our young people move through the elementary and secondary schools in Massachusetts, they (and their parents) must be assured that the Commonwealth will always have a capstone of educational excellence in the form of its public university when the time comes to make the transition to undergraduate and graduate programs of learning.

Certainly the evidences of support manifested in the actions of the executive and legislative branches of the state government in recent years give strong assurance that there will be no slacking of effort to make good the University's aspirations toward comprehensiveness of service and indeed toward the greatness that will come if we are able to invest professed ideals with the sure practice of high competence.

In practical terms, what are these evidences of support and of aspiration toward comprehensiveness and excellence? Within my own tenure as President, the state appropriation for operation of the University has increased by more than 30 per cent, to a total of almost 20 million dollars. Construction of new buildings and laboratory facilities within this same four-year period has amounted to almost 30 million dollars, plus about eight million dollars in building renovation, utilities and site development.

In return for this investment by the Massachusetts taxpayer, the University has made great gains in all areas of instruction, research and public service. In enrollment, we have increased our student body in the last four years by almost 70 per cent. Thus, fall-semester enrollment in 1960 was 6,495; in 1963, 8,811; and in 1964, 10,497.

To provide high-quality instruction for these students and to conduct projects adding to man's knowledge and enhancing his cultural and economic well-being, the University has worked hard to bring faculty salaries up to a level that permits us to compete in the national

market for the upper echelons of talent and ability. The average salary for faculty members at the University of Massachusetts in the academic year 1963–64 stood at $9,400, representing an increase of 25 per cent over the average salary paid in 1960.

Such increases in salary, so essential to university quality, constitute an investment rather than an out-and-out cost to the taxpayer. This is true because it is practically a law of professional life that ability attracts ability; the more competent a faculty becomes, the easier it is to recruit other able people to join the staff. Evidence of the tangible kind of return there is on such an investment exists in the University's research programs. Thus, in 1960 the University was granted about $500,000 for sponsored projects. In 1963–64, the figure stood at five million dollars, with many of the current projects being directly beneficial to Massachusetts industry and to the economy in general.

To maintain this flow of knowledge, in both basic and applied fields, the University has long recognized that it has a clear responsibility to increase its graduate offerings and provide appropriate facilities where advanced work may be carried on under conditions that meet the highest professional standards. The need is beyond dispute: both the state and the nation are involved in massive projects requiring the best-trained personnel that can be made available by our colleges and universities. It is therefore unthinkable that the excellent training and research facilities found in Eastern Massachusetts should not be balanced by comparable facilities in the western part of the state. The question is not one of rivalry between the two areas: it is, much more importantly, a matter of bringing the Commonwealth up to a level of optimum effort, particularly in the fields of science and technology.

To do this, there must be a just distribution of resources so that these are easily accessible to interested students throughout the state. Enrollment figures already indicate that the University's Graduate School is rapidly becoming a center of advanced studies. The student body on the graduate level has more than doubled in the past four years. And fully as important is the fact that doctoral programs available to students seeking professional qualifications for careers in industry, business, science, education and other fields have also doubled — from 13 offered in 1960 to 26 presently offered. Master's programs are also increasing, the Graduate School now having 42 such curricula available for interested students.

While we are thus contemplating a major graduate training and research center at the University in Amherst, as well as increased development of undergraduate programs, it is obvious that such plans do not rule out extension of the University's programs to other parts of the state. The University of Massachusetts is a state-operated and therefore a state-wide facility. With the staggering increase in the number of applicants for admission to the University received during 1963–64 (a total of some 13,000 for 2,600 places available in the freshman class), leaders in the legislature recognized this state-wide role and proposed establishment of the University of Massachusetts — Boston. Upon enactment of appropriate legislation, the University administration assured the parents of students in the Boston area that the new University would be ready for 1,000 students by September, 1965.

Other, similar facilities may be needed in the future. It is my hope, however, that there will be no proliferation of plans for new institutions without the direct involvement of the University in the necessary evaluation process. What we must always bear in mind is that we are trying to evolve an educational *system* in the Commonwealth, and not simply the multiplication of institutions whose roles and functions are not clearly related to the overall design. A rational and profitable system will certainly not evolve unless there is a logical differentiation of educational functions among all of the state's facilities of higher education. What is needed, in other words, is a general pattern or design by which all new proposals may be tested to determine if 1) such a new program is needed, 2) it does or does not duplicate existing programs, and 3) it is educationally sound and valid.

In Massachusetts we have been fortunate in the manner in which community colleges were founded and the state colleges and technological institutes developed in order to achieve a basic differentiation of functions. But the place of the state university in this relationship — and in the relationship of these other institutions to the state university — must never be misconceived. There must be careful definition of functions, with each institution striving for excellence within its clearly defined sphere. In my own view, we must avoid the mad scramble found in other states where every institution is trying to be a university, duplicating costly facilities beyond reason. The sound concept is that there be the University of Massachusetts (with branches) as the capstone of higher education and the only public institution empowered to grant doctoral degrees unless, when need is demonstrated, it and the Board of Higher Education approve another state institution of higher learning to give such degrees jointly with the University.

This recommendation is not made to place the University of Massachusetts arbitrarily at the top of the educational hierarchy. What it is intended to do is to insure that the Commonwealth's system of higher education will be *organically* and *logically* developed for purposes of efficiency, economy, extension of opportunities, and a concerted pursuit of excellence. Such will not be the

case if well-intentioned but spur-of-the-moment efforts are made to launch new "university-level" programs outside the purview of the University of Massachusetts.

There is no doubt that increased coordination of programs is one of the major answers to many of the Commonwealth's problems in higher education. A coordinating board may well be needed to supply the necessary guidelines that will assure the system's developing in an orderly and efficacious manner. But it should be borne in mind at all times that the University of Massachusetts has reached its own level of development and quality that require its having the fullest measure of support. There is also the hard fact that any judgment of a state's system of higher education must inevitably start with the state university. And rightly so. If there is excellence at this institution, it is easy to surmise that there might be excellence at the community and state colleges and at the technological institutes. If there is mediocrity at the state university, on the other hand, then it is even easier to conclude that such mediocrity permeates the entire system.

THE CAPSTONE OF EXCELLENCE

As President of the University of Massachusetts, I am pleased to report to the people of the Commonwealth that there is ample evidence of high quality at the state university. Through self-evaluation, experimentation and innovation, we are determined to continue to move upward. And we are therefore proud that in the past four years objective evaluations of the University's programs have resulted in full accreditation of curricula in every area where national accreditation is available. The high point of such regard for the University's scholarly accomplishments and general effectiveness came this summer with the granting of the University's petition to found a chapter of Phi Beta Kappa on its campus. Of 42 institutions submitting such petitions, the University of Massachusetts was one of only seven to receive this important recognition of its programs in the arts and sciences.

Another mark of recognition of the University's active pursuit of what is best for its students came from the Danforth Foundation in the form of a grant to experiment with the residential college program, aimed at preserving the student as an individual and not as a mere statistic in a growing mass. Aided by the Foundation, the University has launched a residential college in its new Orchard Hill Residences. If successful (and there is every evidence that it will be), the program will be conducted in other dormitories. It provides an arrangement whereby students living in college residences are guided by a faculty master who maintains office hours in the residence itself. In addition, there are resident faculty preceptors and fellows who, being on the scene, give students the benefit of individual attention so necessary in maintaining the sense of personal identity and integrity at a large and still growing institution.

To merit the professional regard of the great community of colleges and universities throughout the country, an institution must demonstrate that it is actively and sincerely interested in promoting creative activities of a genuinely scholarly calibre. The establishment of The University of Massachusetts Press has done a great deal to indicate that we are indeed such a campus. The Press has, with only a few titles on its published list thus far, received good reviews and is now working on a number of excellent manuscripts. *The Massachusetts Review*, distinguished quarterly founded at the University and published jointly with Amherst, Smith and Mount Holyoke Colleges, has readers throughout the world and has been described as one of the attractive and important journals in the field. As for general publications by the faculty, more than 30 full-length books, 250 articles, and a host of other reports and documents were produced during the period covered by this Report.

In recognition of the need for continued excellence in teaching, the University in the fall of 1963 presented its second Distinguished Teacher Award. The award was made by the President at the Opening Convocation to George Robert Richason, Jr., Professor of Chemistry in the College of Arts and Sciences. Again, the University is pleased to acknowledge the generosity of Dr. Clifford B. Cherry of Los Angeles and the late Dr. Kathryn B. Cherry in making this annual award possible. Another important form of recognition of academic excellence came in January, 1964, when the Glass Container Manufacturers Institute, Incorporated, provided generous financial support for the University's first endowed chair — the Nicolas Appert Professorship of Food Science and Technology. Appointed to the new professorship was Dr. Frederick J. Francis of the Department of Food Science and Technology in the College of Agriculture. The chair, established as a means of recognizing outstanding teaching and research, is named for Nicolas Appert, French experimenter who in the early 1800's invented the technique of preserving perishable foods in glass containers by heat processing.

A university is also known by the research it conducts for the benefit not only of its own programs, but of the community of educational institutions throughout the nation. The University's Office of Institutional Studies, founded in 1961, has contributed greatly to the fund of

knowledge needed by the Commonwealth and by national agencies and institutions to keep abreast of the latest trends in enrollment, staffing, general academic operations, and allied areas. The Office's library of periodicals, reports, and other documents related to programs in higher education has been an extremely useful tool.

The University also continues to be a leader in the use of data-processing equipment for the rapid solution of statistical problems in admissions, space utilization, general accounting and inventory procedures, and information-gathering — all of which make for greater efficiency and economy of operation. Published reports on the University's experience in the use of computers for scheduling, admissions work, and record-keeping have elicited nation-wide interest in the University's pioneering activities in these areas. Another data-processing facility, the Research Computing Center, is now operating on an almost 24-hour per day basis. Utilized by many departments, but preponderantly by faculty members engaged in scientific research, the Center will soon have new equipment which will make the University facility one of the finest in the region in this highly important work.

To enlarge the scope of the University's public service activities, the past four years have seen the establishment of institutes in polymer research (dealing with basic problems in the chemistry of plastics and rubber materials); in Massachusetts population problems; in environmental psychophysiology (for research helpful to preserving the health and safety of personnel in industrial settings); and in agricultural and industrial microbiology. Other facilities now being planned or already operative are a Labor Relations and Research Center and a Water Resources Research Center. All of these, along with the Cooperative Extension Service, the Speech and Hearing Center, and the Bureau of Government Research, contribute services of major importance to the enrichment of the Commonwealth's society and economy.

In other "outreach" activities, the University this year established a unique graduate program for professional journalists. Founded jointly by the University and the New England Society of Newspaper Editors, the program's aim is to advance journalism as a profession and to provide an opportunity for newspapermen to approach journalism as an area of scholarship. The program is also designed to encourage persons in the newspaper field to take advanced study in one of the liberal arts curricula that can be of continuing value in the journalist's work.

On the international scene, the University has begun active work in establishing and operating a secondary school for women in Uganda, Africa, under a contract with the U. S. Agency for International Development. Scheduled to open in January, 1965, the Tororo School for Girls will accommodate 420 students, offering courses in business, home economics, and college preparatory programs. The degree of cooperation between University officials (particularly Dr. Albert W. Purvis, Dean of the School of Education) and Uganda officials, plus the total involvement of the University from the beginning of plans to found the school, are the features that set this program apart from other educational aid projects in underdeveloped countries.

In another part of the world, the University began exploring the possibilities of establishing an honors college program by which outstanding students majoring in German might spend a year at the University of Freiburg in West Germany. Under another program, supported by a grant of $100,000 from the U. S. Office of Education, the University conducted a nine-week language institute for 60 secondary-school teachers of French. Administered with funds granted under provisions of the National Defense Education Act, the program gave participants an opportunity to attend the institute at Arcachon, France, under the direction of Dr. Stowell C. Goding, Professor of French at the University.

On the campus at Amherst, similar activities were planned and held in the interest of providing major interchange of information on teaching in Massachusetts schools. A concern with the continuing improvement of standards for teachers of social studies in the Commonwealth led to a conference in April, 1964, for 100 teachers of social studies. At the same time, approximately 200 teachers of science in the Bay State came to Amherst under auspices of the University's School of Education to become better acquainted with the latest developments in science curricula in the elementary and secondary schools.

The latter are but two examples of the kinds of conferences the University initiates or sponsors in behalf of improved education on all levels. Summer conferences in general, attended by various off-campus groups, have increased in the past four or five years so that at present more than 20,000 persons utilize the University's facilities for seminars, conferences, and similar educational programs. Along with a greatly enlarged summer school for both undergraduate and graduate students (874 in the first session of 1959 to almost 2,000 registered for the first session in 1964) the campus at Amherst is literally a year-round facility for the advancement of education from the freshman to the fully professional level.

With all of this activity, the University is also rapidly evolving as a cultural center in its own right. It has its own symphony orchestra, chorale, and concert and marching bands, all of which have been given high

praise by reviewers, critics, and the general public. In addition, the University in the past year presented almost 50 exhibits of painting and sculpture under auspices of the Department of Art. The campus also enjoyed a host of concerts, lectures and dramatic productions, the latter presented under direction of able young faculty members in the Department of Speech. Such activities are increasing both in quantity and quality, and we intend to give them an appropriate setting in the new Fine Arts Center designed by Eero Saarinen Associates and scheduled for construction in the coming year.

Indispensable to all of the activities I have mentioned thus far is an adequate library. Although budgets and appropriations have increased in recent years, the University Library consists of approximately 300,000 volumes — a respectable but by no means a thoroughly satisfactory collection. Our goal must be something closer to one million volumes by 1970 if we are to provide the reference materials needed for a fully developed program encompassing needs from the freshman through the advanced professional level. For housing such a collection and maintaining an orderly library system, there is no doubt that a new and functional library building must be constructed in a central part of the campus in Amherst. Certainly, therefore, this must constitute a high priority item by which to continue our growth as a major center of learning and research.

The foregoing account, while not complete, should give our citizenry some idea of the ferment, of the progress on the University's campus in Amherst. It is not always possible to communicate to the public — or for the public to retain — information issued in news releases about the day-to-day developments at an institution on the move. Many will certainly keep in mind that the University's football team is a thing of excellence in itself — and we are proud of it. Many others will recall the exciting College Bowl contests over national television in which four of our students prevailed over teams from other colleges for a well-earned championship which brought more than $10,000 into the University's scholarship fund. Here too we are proud that our institution can produce not only competent students, but students who readily reflect the very excellence that we constantly strive to instill into our total program.

IMPERATIVES FOR THE FUTURE

Public support of this program is therefore vitally, indeed critically, important as we continue into the 1960's and 70's. It is important because the University, along with all public universities, is in a state of dynamic evolution borne of the need to assess what future demands will be and to plan resources for an effective response. There are a number of such demands that we can easily identify at present:

- Increasing urbanization and the problems confronting growing numbers of people concentrated in city environments.
- The impact of automation on industry, business, and labor — particularly the latter, insofar as automation can be both a blessing and a threat where employment is concerned.
- The massing of forces to end the threat of man's worst diseases and at the same time to develop profitable programs for the increasing numbers of older people in our society. Planning of the University's new Medical School Program will thus involve facilities for research in this effort.
- Thorough analysis of our theories and techniques of education in an increasingly automated society, to the end that man will take advantage of machines but will not himself become a "machined" product.
- Greater emphasis than ever before upon the importance of public service in an age of immense technological and scientific progress, perhaps by development of a concept that in every educated person's life, time must be allotted for such service even to the point of its becoming a "second profession."

I list these challenges (and they are but a few that we will face) not in any arbitrary order of importance. They are *all* important, and we shall find them the objects of concern of every living American — and certainly therefore relevant to the attention of those universities which began their mission as a means of responding to great human needs.

Underlying all of these challenges is the tremendous increase of population along with the multiplicity of demands deriving from the force of the technological revolution that is markedly affecting the social, economic and cultural development of every nation on earth. The predictable outcome of these upsurges in the United States will be a great increase in new professions and vocations — and striking changes in the very lives we live from day to day. In this country, the heaviest burden will therefore necessarily be on the public

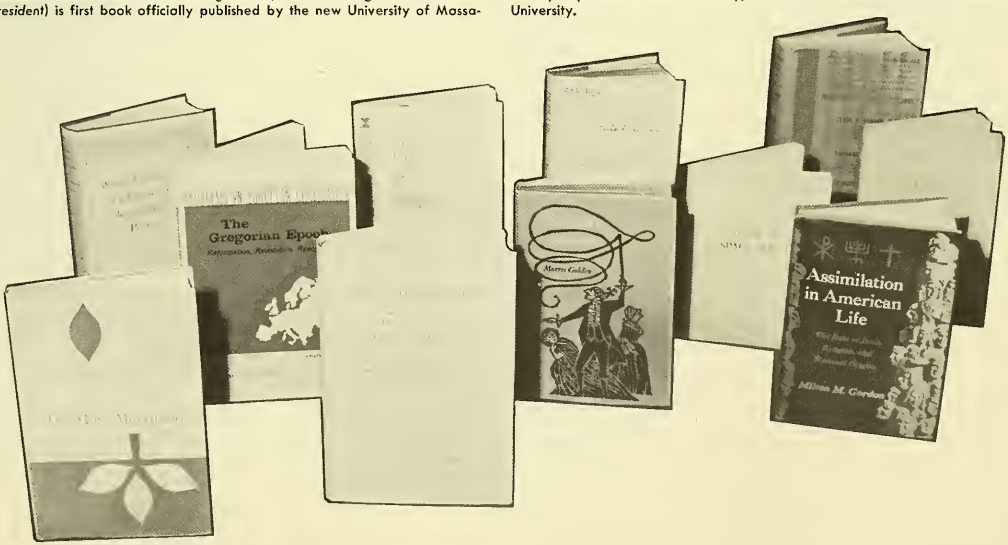
universities not only to educate the coming millions but, because of their inherent flexibility, to provide the immense patterns of research and service that will prove the American public university equal to the challenge of a new age of man.

On the practical level, this means that we must serve students first — thousands upon thousands of additional students each year. We must be prepared to take as many of them as we can; but we must guarantee that we do not become simply mass producers of trained "talent." Our offerings must be directed to the legitimate and valuable aim of *educating* men and women, not to providing a bargain-basement mixed bag of courses for the casual seeker of minimal proficiency in an easy field. We cannot, therefore, permit rampant proliferation of courses and curricula simply because a state university is often asked to be all possible things to all people. This is not the way to excellence, but to mediocrity, and Massachusetts through its state university has served notice that mediocrity is not enough for a state that has achieved manifest greatness through her private institutions of higher learning. The vigorous and sincere support given by the leadership in the executive and legislative branches of the government, by a preponderant number of representatives and senators in the General Court, by outstanding citizens in the Commonwealth's cities and towns, and by leaders in the other sectors of our educational system has resulted in an historic quickening of attention to the needs of education on all levels. And what the citizenry of the Commonwealth can now look forward to is the planning of a grand design that can bring Massachusetts the distinction of being first in the world in private and public education.

I do not underestimate the challenge posed in such an objective. And yet I firmly believe that our aims should be great aims, our design a grand one, and our hope for accomplishment the most vigorous and purposeful. I say this even though I am aware that the fulfillment of such a design will cost more money than was ever allocated before for education in this Commonwealth. But the money must be provided. We are now embarked on the most dynamic program of educational renewal and improvement in the whole history of the Commonwealth and perhaps of the country itself.

Our tax dollars, to paraphrase Justice Oliver Wendell Holmes, must therefore be considered as buying civilized society itself. Lacking such a view, we will fall prey to that inevitable undermining of our basic aims as a free people that comes when the citizen loses his public conscience and abandons his sense of responsibility to the future. When this happens, and on a general scale, education is the first area to suffer, irreparably; for what happens is that the well of learning is forcibly dried up and succeeding generations of citizens are affected. The "freedom of competence" that all citizens should enjoy up to the limit of their abilities is stifled and we get that threat to a free civilization that President Emeritus Henry Wriston of Brown University warned against when he said that "Every incompetent citizen is a menace to the freedom of all." It is to the elimination of this kind of citizen on the broadest possible scale that we must all be dedicated. Through our tax dollar we give government the means by which the process can be started. The process itself — manifested in our educational system — is the most precious possession we have for shaping the enlightened citizen of tomorrow. If the era now upon us is to be an era of new enlightenment in human affairs, then we must commit all our energies and all our support to our educational effort in these latter years of the 20th century.

A selection of books recently published by members of the University faculty. Volume second from left in foreground (*Calvin Coolidge: The Talkative President*) is first book officially published by the new University of Massachusetts Press. Volume was edited by Professor Howard Quint, Head of History Department at the University, and Professor Robert Ferrell of Indiana University.



DR. RICHASON NAMED DISTINGUISHED TEACHER OF THE YEAR

Professor George R. Richason, Jr., of the Department of Chemistry, College of Arts and Sciences, receives Distinguished Teacher Award for 1963 from Provost Gilbert L. Woodside. Professor Richason (l.) was second recipient of award given by the Board of Trustees to foster excellence in teaching.

REGISTRAR LANPHEAR RETIRES

After more than 40 years of distinguished service to the University of Massachusetts, Marshall O. Lanphear retired from his position as Registrar in the fall of 1963. He is shown in this picture at reception given in his honor and attended by hundreds of his colleagues and friends. Mr. Lanphear (c.) is joined by Mrs. Lanphear in receiving best wishes from Professor Harold Cary of Department of History. At 1964 Commencement, Mr. Lanphear was granted the degree of Doctor of Humane Letters, *honoris causa*, for his many years of outstanding service to the University and to thousands of students.

NEW MEMBERS OF UNIVERSITY ADMINISTRATION

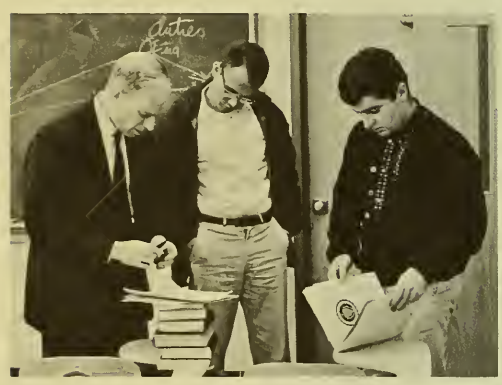
On left, Dr. Oswald Tippo, who succeeded Dr. Gilbert L. Woodside as Provost of the University after Dr. Woodside accepted a high post with the National Institutes of Health. Dr. Tippo, an alumnus of the University, previously served in major faculty and administrative positions at Yale, Illinois, Colorado, and New York University. In center, Robert J. McCartney, who became Secretary of the University and Director of University Relations, succeeding Dr. John W. Ryan who resigned to accept post of Vice-President of Academic Affairs at Arizona State University at Tempe. Mr. McCartney, a University alumnus, was Director of University Relations at the University of Maryland prior to his return to the University of Massachusetts. On right, Dr. William Tunis, who became Dean of Admissions and Records upon the retirement of Registrar Marshall Lanphear. Dr. Tunis, also a graduate of the University, taught at the University of Connecticut and the University of Massachusetts, and was Head of the Waltham Field Station before taking his new post as Dean of Admissions and Records. In addition to these appointments, Dr. Leo F. Redfern, Director of the University's Office of Institutional Studies, was named to the new post of Dean of Administration.

PORTRAIT OF A UNIVERSITY

A university is a plan and a purpose,
a design for progress,
not alone for itself but for all society.
It is a permanent frontier
for the extension of knowledge
among all who appreciate and profit from its uses.
The model pictured above and the photographs
that follow are intended to show the
University of Massachusetts as such a frontier,
where people and programs are dedicated to
increasing man's knowledge and furthering the
aims and purposes of a free society.

New lecture hall—
School of Business Administration

Dr. Winfred Bernhard, Department of History,
winner of 1964 best-manuscript award
sponsored by Institute of
Early American History and Culture

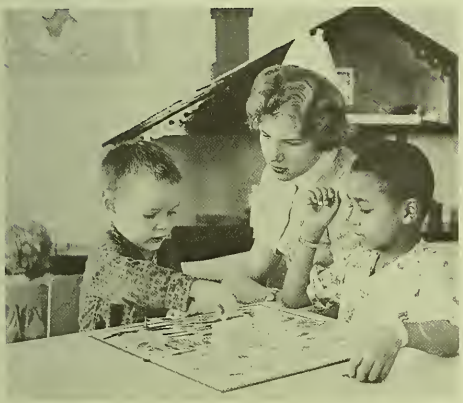


Concentrating . . .

Class in television production—
Department of Speech

Professar H. Leland Varley, Master af Orchard Hill Residence, with students in new residential-college program

Student in School of Nursing trains in haspital pediatric ward.



Department of Art

Advanced-placement exams

Session in speech therapy—
student trainee with Dr. Inez Hegarty,
Director of Speech and Hearing Center

Skinner Hall—
School of Home Economics

informal
discussion . . .

Resources of science—slides . . .

. . . and graphs

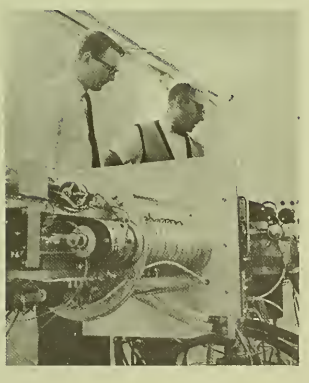
University Library

Dr. Henry Van Roekle,
College of Agriculture, national
authority on avian diseases

Laboratory discussion—
Department of Landscape Architecture

Poet Joseph Langland,
English Department,
works with Composer Morton Gould
on production for World's Fair.

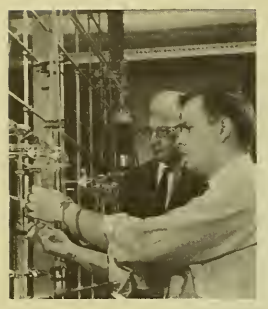
Dr. Howard Quint, Head of
Department of History,
checks galleys of
book he co-edited—
Calvin Coolidge:
The Talkative President



New pulsed neutron generator
for studies in nuclear science.
Professor Joseph Marcus (r.),
Department of Civil Engineering,
directs program for School
of Engineering

Dr. Edwin F. Driver, author and
member of Department of Sociology
an Anthropology, works with
graduate students on population research.

Dr. Thomas Stengle (l.), Chemistry Department, works with graduate student in laboratory research on interaction between metal salts and solvents



Observation gallery—
Mork's Meadow Laboratory School
in University's School of Education

Major in chemistry

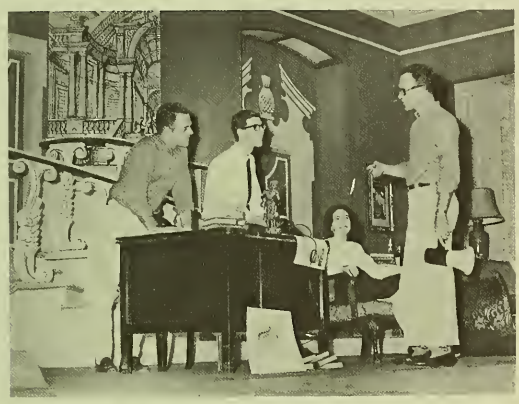
Final exams . . .

Dr. Edward C. Moore, Dean of Graduate School, presents report to faculty group.

New facility—
South Dining Commons

Yankee Conference champions—in action . . .

Rehearsal—
University Theater production—
Harry Mahnken, Department of Speech, directing



Tools . . .
for scientific precision

Toward artistry . . .

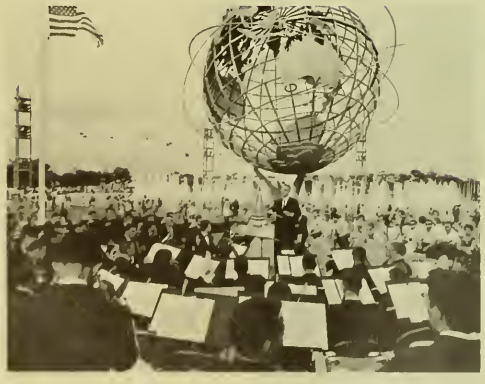
University Symphony Orchestra—
Ronald Steele, Department of Music, Director

1964 Commencement Speaker—
U. S. Senator Hubert H. Humphrey

Honorary degree recipients: University Registrar Marshall Lanpheor (l.), University Trustee Harry D. Brown, Historian John Hope Franklin (third from right), Economist Seymour Harris, and Senator Humphrey. Congratulations from Governor Endicott Peabody and President John W. Lederle (third and fourth from left.)

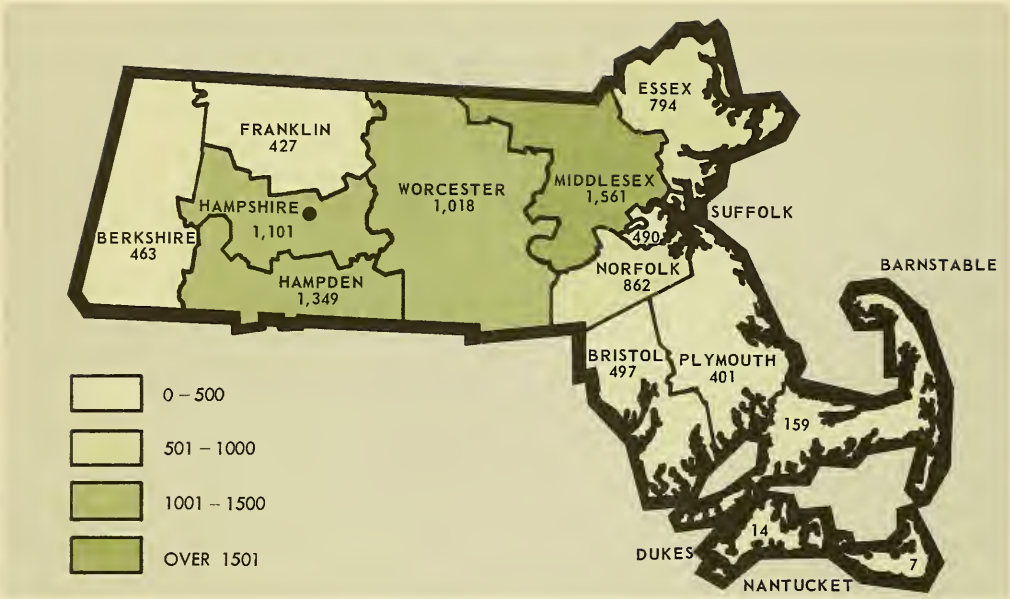
Below, left: University Concert Band performs during Massachusetts Day at New York World's Fair . . .

Right: Familiar quartet — University's championship TV College Bowl team . . .



APPENDICES

- Massachusetts-Resident Students at the University of Massachusetts
- Projected Enrollments
- Report of the Treasurer



Massachusetts-Resident Students Enrolled at the University of Massachusetts

(BY COUNTY — FALL, 1964)

Chart above includes all of the Massachusetts-resident students enrolled at the University, including: Four-year undergraduate enrollment — 7,514; Graduate School — 1,203; two-year Stockbridge School of Agriculture — 426. Total — 9,143.

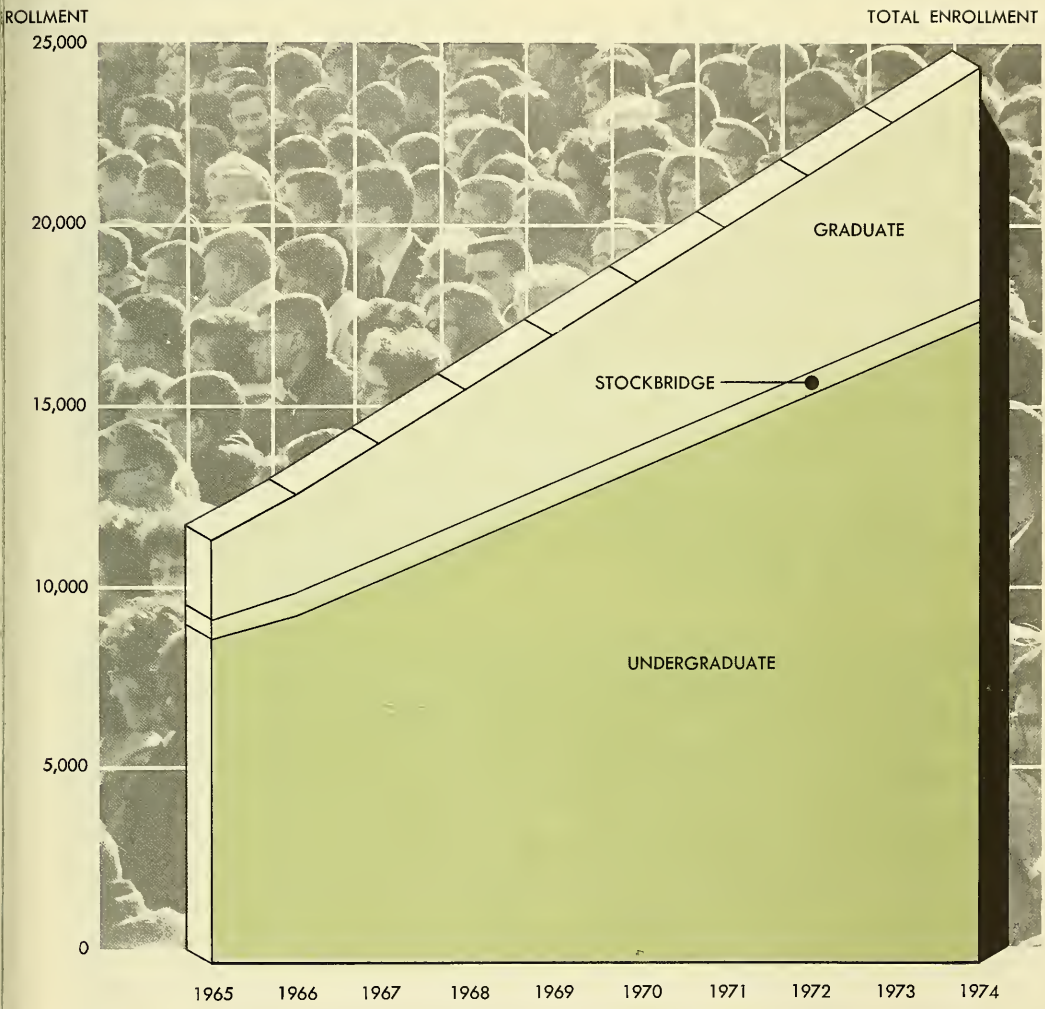
Of 351 cities and towns in the Commonwealth, 323, or 92 per cent, are represented in the four-year undergraduate enrollment listed above.

A total of 64.9 per cent of such undergraduate students came from Eastern Massachusetts (east-west division determined by a line drawn north and south through the approximate center of Worcester).

Of the 7,514 undergraduates, 5,074, or 67.6 per cent, reside in the Commonwealth's eight metropolitan areas. The preponderant number of students (35.7 per cent) come from the Boston metropolitan area. The Springfield-Holyoke area provides 17.2 per cent; Worcester area, 5.2; Brockton area, 2.5; New Bedford area, 2.3; Lawrence area, 1.8; Lowell area, 1.5; and Fall River area, 1.4.

Long Range Enrollment Projection

SEPTEMBER 1965 – SEPTEMBER 1974



Lower segment of graph indicates projected undergraduate enrollments at the University. Next segment gives projections for two-year Stockbridge School of Agriculture. Top segment reflects projected enrollments in the University's Graduate School. Line along top segment indicates projected total enrollments at the University.

These projections are for the campus in Amherst only; they do not include projected enrollments at the University of Massachusetts-Boston or the University's Medical School.

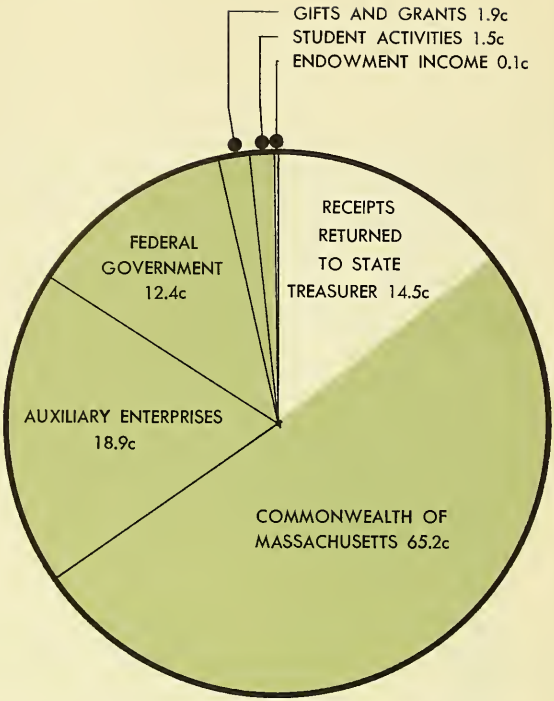
REPORT OF THE TREASURER

Where The Operating Dollar Comes From . . .

For the fiscal year 1964 the University received from all sources $23,488,376.22 for operating purposes. Of this, a total of $15,315,879.59 was appropriated by the Commonwealth, amounting to 65.2 cents out of each operating dollar.

However, the University returned to the State Treasurer, as required by the State Constitution, $3,400,257.32 representing collections for student tuition, room, and sundry sales and services. Thus, the net cost to the taxpayer was only $11,915,622.27 or 50.7 cents out of each operating dollar.

The following sources provided the balance of the operating dollar: Federal government 12.4 cents, student activities 1.5 cents, auxiliary enterprises (dining halls, etc.) 18.9 cents, gifts and grants 1.9 cent, and endowment income 0.1 cent.



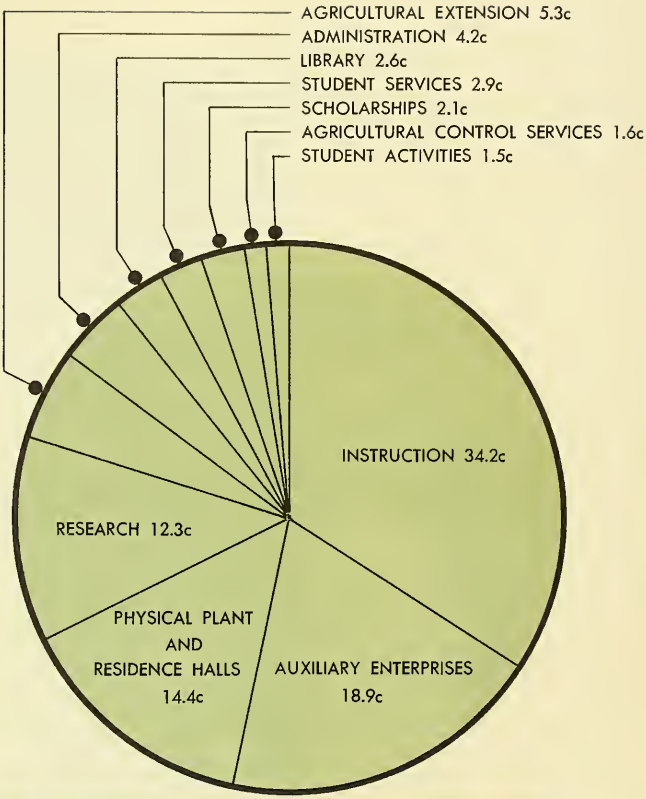
1964 SOURCE OF FUNDS	TOTAL AMOUNT	PERCENT OF TOTAL
COMMONWEALTH OF MASSACHUSETTS:		
FUNDS PROVIDED BY UNIVERSITY RECEIPTS		
TUITION	$ 1,786,488.85	7.6
RESIDENCE HALLS	1,332,122.63	5.7
SALES AND SERVICES	281,645.84	1.2
SUB-TOTAL	$ 3,400,257.32	14.5
NET FUNDS PROVIDED BY TAXPAYER	11,915,622.27	50.7
TOTAL	$15,315,879.59	65.2
FEDERAL GOVERNMENT	2,920,145.19	12.4
STUDENT ACTIVITIES	352,045.93	1.5
GIFTS AND GRANTS	439,809.36	1.9
AUXILIARY ENTERPRISES	4,445,076.88	18.9
ENDOWMENT INCOME	15,419.27	.1
TOTAL RECEIPTS	$23,488,376.22	100.0

How It Is Spent . . .

Direct instructional costs naturally represented the largest single operating expenditure requiring $8,016,983.38 (or 34.2 cents of each dollar) out of total expenditures of $23,488,376.22. Research and library, expenditures closely related to instructional costs, required 12.3 and 2.6 cents respectively of the operating dollar. Agricultural extension services and state agricultural control services required 5.3 cents and 1.6 cents each.

Operating and maintenance of the physical plant and residence halls accounted for 14.4 cents of the dollar. A total of 18.9 cents out of every dollar went toward auxiliary enterprises (dining hall operations, etc.) and 1.5 cents into student activities. The remainder of the operating dollar was expended as follows: administration 4.2 cents, student personnel services 2.9 cents, and scholarships 2.1 cents.

The chart on the right shows that of the 34.2 cents spent for direct instructional costs, a a total of 30.6 cents (89.5 per cent) came from state appropriations. The remainder — 3.6 cents (10.5 per cent) — was provided by the Federal government and from gifts and grants.



1964 HOW SPENT:	TOTAL AMOUNT	PERCENT OF TOTAL
INSTRUCTION:		
STATE FUNDS	$ 7,183,294.13	30.6
FEDERAL FUNDS	741,254.02	3.2
GIFTS AND GRANTS	92,435.23	0.4
TOTAL INSTRUCTION	$ 8,016,983.38	34.2
LIBRARY	607,516.39	2.6
RESEARCH	2,886,615.88	12.3
AGRICULTURAL EXTENSION	1,240,577.32	5.3
STATE AGRICULTURAL CONTROL SERVICE	386,231.85	1.6
PHYSICAL PLANT AND RESIDENCE HALLS	3,371,874.59	14.4
ADMINISTRATION	1,002,579.06	4.2
STUDENT SERVICES	693,737.46	2.9
SCHOLARSHIPS	485,137.48	2.1
STUDENT ACTIVITIES	352,045.93	1.5
AUXILIARY ENTERPRISES	4,445,076.88	18.9
TOTAL DISBURSEMENTS	$23,488,376.22	100.0

UNIVERSITY OF MASSACHUSETTS
ENSE PETIT PLACIDAM SVB LIBERTATE QVIETEM
AMHERST·1863·

SEP 1965
WILBY